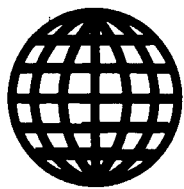


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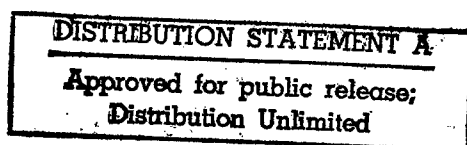


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ADVANCED MATERIALS

EC Selects Databases for Materials Network

92WS0353A Paris COMPOSITES ET NOUVEAUX MATERIAUX in French 4 Feb 92 p 4

[Unattributed article: "EEC General Directorate [DG] 13 Initiative to Standardize 11 European Materials Databases"]

[Text] In 1990, DG-13 toured several European countries to encourage potential users and manufacturers to use such an information source. Another objective of this demonstration program is to achieve a genuine standardized European materials information system. To this end, 11 European materials databases were selected: three from France, three from the United Kingdom, one from Italy, three from Germany, one from the Netherlands. All these are factual nonbibliographic databases. They contain only scientific data on the description of materials, their characteristics and properties, and ancillary data on how to use these scientific data. (See box)

[Box, p 4]

The European Materials Databases Selected

- H-Data (Hydrogen Data), France: hydrogen-materials interaction.
- Metals Data File, United Kingdom: properties of metals, mechanical and physical properties of ferrous and nonferrous alloys.
- HTM-DB [high-temperature materials database], CEC [Commission of European Communities] Joint Research Center, Petten, the Netherlands: mechanical properties of high-temperature materials.
- CETIM-Materials [Technical Center for the Mechanical Industries], France: common properties of engineering materials, plastics, metals, composites, adhesives, lubricants, to assist design and engineering departments in selecting materials.
- Solma, Germany: specific technical properties, mechanical, technological, and physical test values for ferrous and nonferrous alloys to be used in pressure vessels.
- Peritus, United Kingdom: selections of metals and plastics, and processes for design and engineering departments.
- Infos, Germany: Properties of scission values of metallic materials for turning, drilling, and crushing.
- Thermodata, France: Thermodynamic properties and complex equilibrium computations for nonorganic materials.
- Matus, United Kingdom: mechanical, thermal, electrical, and environmental properties and machining of plastics, metals, ceramics, glass, and other composites, based on manufacturers' technical datasheets.
- Polymat, Germany: characteristics, properties, appearance of plastics machining and implementation.
- Cometa, Italy: technical characteristics of metals and components for design and engineering departments.

AEROSPACE

German Aerospace Research Institutes Relocated to Berlin

92MI0280 Bonn DIE WELT in German
12 Feb 92 p 23

[Article by Richard Scheibel: "DLR Institute of Planetary Reconnaissance in Berlin—Return to the Original Site"]

[Text] With its Institute of Planetary Reconnaissance and Institute of Space Sensor Technology, the German Aerospace Research Institute (DLR) has returned to the place of its birth. The work of the former GDR Institute of Cosmological Research and a number of DLR activities previously based in Oberpfaffenhofen have been brought together in Berlin-Adlershof, which once saw the beginnings of the first aircraft research work.

Now officially taken over, the center will continue much of the former Cosmological Research Institute's work. Following appraisal by the DLR and the Science Council, almost all the staff of the former GDR's well-known institute have been taken on: The DLR intends to create about 300 new jobs overall in Berlin.

The main thrust of the work at present is the preparation by the Institute of Planetary Reconnaissance of an experiment for the flight of a Russian Mars probe, scheduled for 1994. Two electronic cameras will deliver pictures of the surface of Mars that will be considerably superior in scope and resolution to the material already obtained from the Viking mission.

The Soviet Union, as it then was, had already issued a worldwide invitation to join this project several years ago. As a result, both the DLR and the GDR produced suitable camera designs. According to earlier plans, they were both to be used for Mars observation, with different duties.

Immediately after German unification, the DLR set to work on bringing German work on the Mars project together. The establishment of the institutes in Adlershof marks the success of these efforts, and the complex electronics and the optical components are now being developed under the same roof.

One advantage for the Mars mission is that major technical and electronic components of the two systems will now be standardized. They will scan the surface of Mars a strip at a time. One of the cameras will supply photographs of particularly interesting regions with a resolution of down to a minimum of 10 meters. The other one will photograph the stars for a three-dimensional representation and produce images in various spectral ranges. The scientists in Berlin are currently trying out a prototype. They are conducting their trials in the eastern German open cast brown coal mining areas, which are very similar to the surface of Mars. By taking photographs from an aircraft, they can calibrate the cameras and evaluate the data under realistic conditions. With its second Adlershof establishment, the Institute of Space Sensor Technology, the DLR is seeking primarily

to improve the technology of near-earth reconnaissance. In order to concentrate work in this field at Adlershof, some members of the staff will also be transferred from Oberpfaffenhofen to Berlin. The aim is to use sensitive sensors and knowledge-based expert systems to give remote sensing greater relevance. At the same time, the satellite will increasingly transmit ready-processed data to earth so as to limit the flow of enormous quantities of data that can only be evaluated on the ground. In the future it will thus be possible to have rapid, meter-precise information about narcotics-producing poppy plantations, for example, or illegal discharges into rivers.

A third DLR division to come under the Adlershof center is the satellite ground station at Neustrelitz in Mecklenburg, which will enable the researchers to communicate easily and directly with satellites belonging to the former East Bloc States.

The Berlin site, which will gradually expand into a research center with numerous scientific and technical facilities, including some belonging to other institutes, still houses items left behind by the DLR's predecessors. For example, there are still old aircraft engine test rigs and wind tunnels. The one dating from 1935 will probably soon become a monument to the fact that this was the cradle of aviation at the start of the century.

Germany: Two-Stroke Diesel Aeroengine Development Nears Completion

92WS0293A Stuttgart FLUG REVUE in German Jan 92 pp 80-81

[Article by Heinrich Hemker under the rubric "Technology Journal": "Zoeche's Development in Final Phase; Two-Stroke Diesel: Aeroengine of the Future?"; first paragraph is an introduction]

[Text] Michael Zoeche from Munich is developing in grand style a diesel aircraft engine. He is aiming here at the general aircraft market, where the performance figures aimed at, i.e., light weight and low fuel consumption, are desired.

The engine block on the test bed almost disappears beneath the multitude of tubes, test leads and probes. Just the three-blade propeller outfitted with a guard grille—a controllable pitch propeller from MT [expansion not provided]—gives away the fact that an aircraft engine is being tested. When the engine is started the propeller turns in a split second into a whirring disk. The running noise is distinctly noticeable even in the sound-proof test room. There are digital data recorders here that record the engine's individual operating parameters. The engine tests are controlled and monitored by the operator from here.

Low Weight per Horsepower

The test subject is the Zoeche diesel aeroengine. The four-cylinder radial engine operating according to the two-stroke diesel principle has a displacement of 2.7 liters. The unit equipped with a supercharger and turbo-charger weighs only 84 kg, all auxiliary units included.

The engine is to achieve very low fuel consumption. It is designed for a power rating of 110 kW (150 HP).

Why this type of aircraft engine? Michael Zoeche, the developer from Munich, knows the answer. Diesel engines are the thermal engines that have the highest efficiency. This applies not only to the engine's design concept, but especially to its operation under decreased thrust, which is very important for use in aircraft.

A forced-scavenged two-stroke engine was chosen because in operation according to the diesel principle it does not have the losses-by-circulation of the conventional moped or lawn mower engines that got the two-stroke engine its bad reputation. Because the fuel is injected into the combustion chamber not until the end of the compression cycle, no combustion-specific losses are created that result from the employment of the two-stroke principle, not even in terms of exhaust gas figures.

Another merit of the diesel principle is the fact that the reduction in performance with decreasing air density is smaller than in spark ignition engines or gas-turbine engines, because the diesel works with substantially higher compression ratios. The JUMO 205 from the year 1945 already attained operating altitudes of up to 15 km.

As a self-igniter, the diesel engine needs no ignition system. Because each cylinder has its own fuel injection system, there is quadruple redundancy here. The diesel is more reliable than a spark ignition engine from this viewpoint.

The advantages obtained by means of the two-stroke principle are considerable. Valves and valve mechanisms are omitted, whereby weight and probability of breakdown are reduced considerably. The frontal area is reduced in comparison with the four-stroke engine. Consequently, aerodynamically favorable installation in an aircraft frame is made easier.

The radial engine has the smallest and lightest crankcase and a very short crankshaft. Zoeche decided to design the engine in this form for that reason. He developed an arrangement with segmented connecting rods, with which four connecting rods move on the same crankpin. This is possible because in a diesel engine always sufficient pressure acts on the piston surface to press the connecting rod against the crankpin. However, the theoretical reliability is not sufficient for the developer. A patented design sees to it that the connecting rods cannot lift away from the crankpin even in a critical phase.

Total Mass Balancing

By means of the arrangement thus created of the four pistons in a single plane, the rotating and oscillating masses of the connecting rods and pistons can be totally compensated for by means of a counterweight. After outside-acting out-of-balance forces are eliminated a smooth-running vibration-free engine is the result.

The unit support with the auxiliary units and the super-charger drive unit is flange-mounted in front on the

engine block. Because the diesel engine requires, because of the high compression ratio, a strong starter with a correspondingly powerful and tough battery, one falls back on the principle of the pneumatic starter.

Equipping the engine with a supercharger made a very simple system possible here. Compressed air is conducted from a tank via the starting-air valve onto the supercharger blades, which start the engine turning. The used air flows further via the supercharger and turbocharger into the engine so that it builds up boost pressure within the shortest time. This explains the engine's breakneck start that was observed on the test bed.

Of course, the engine is equipped with a generator, though it—another innovation—is completely integrated into the housing as a slip-ringless, and thereby very reliable, design.

The auxiliary units, accordingly the oil and fuel pumps, are integrated into the unit support, which is flange-mounted onto the crankcase. In order to make the danger of leaks and damage as small as possible, Zoche is setting himself the goal of integrating into the housing all the pipelines that it is possible to, design-wise. The philosophy behind this is clear: No leak can occur where there is no pipeline. Dependability and safety were the principal goals here.

Production Version Under Construction

What is the development status now? The basic mechanical problems are considered solved after a development period of more than seven years. The integration of the pipelines into the housing—the pressure lines too—has been concluded. The first production-version engine is to be constructed at the beginning of next year. Optimization of the combustion is being worked on now. An ultrashort injection nozzle will inject the fuel into the cylinder with minimum loss. A special design was necessary for this, because conventional injection nozzles are long owing to the overall height of the cylinder head of a conventional four-stroke engine.

The approval of an aircraft engine requires a very elaborate engine test, so that approval as an aircraft engine can be expected not before 1994. A version having eight cylinders and double duty is planned. Whether the Zoche diesel aeroengine will be the aircraft engine of the future remains to be seen. However, that it is being rated optimistically is proven by inquiries from aircraft manufacturers, who would by all means like to welcome a new option in engine manufacturing.

Germany: Composite Materials, Weight Reduction Set Trend for Future Aircraft Design

*92WS0293B Stuttgart FLUG REVUE in German
Jan 92 p 54*

[Article by H. Hemker under the rubric: "Aerospace Journal": "BDLI Materials Conference in Hamburg; Revolution in Aircraft Construction"; first paragraph is an introduction]

[Text] Weight reduction by means of materials engineering is continuing. New trends were revealed at BDLI's [Federation of the German Aerospace Navigation and Equipment Industry] materials conference.

Hartmut Mehdorn, chairman of Deutscher [German] Airbus GmbH [Limited Liability Company], spoke of a "revolution in aircraft construction" as he outlined the trend in large aircraft construction at the conference of the BDLI.

In his opinion composite materials will play an even greater roll in the future. "To the tune of a 60 to 65 percent share of fiber composites making up an aircraft's weight appears possible," is his prediction.

Mehdorn supports this by the composite materials trend at Deutscher Airbus. After the approval of a carbon fiber primary structural component, the airbus's vertical tail, was obtained for the first time through special trail-blazing work, these elements are being produced by now completely routinely and without technical problems, and the trend is going ahead quickly. The experience gained is being turned into new structural elements. The designing of a wing truss using carbon fiber technology has been completed and construction is to be concluded at the beginning of 1992.

But this still does not represent the end of the possibilities. The designers at Airbus are already working on the design of a fuselage section employing carbon fiber technology. Mehdorn's optimism thus appears justifiable.

One could get the impression from the advance of composite materials that aluminum materials are more or less retreating from aeronautical engineering. The work of several producers from this field demonstrated that this is not the case.

Not only are efforts to improve aluminum alloys by means of additions of lithium being continued more intensely here. The aluminum manufacturers are trying to slow the advance of composite materials also by means of new methods and processes. For example, the Fuchs firm in Meinerzhagen is working on an alloy that is to replace the conventional type 6061.

The new alloy is, in contrast to the old, very corrosion resistant, weldable and good for fabrication in extrusion processes. These properties for the first time make the fabrication of a welded fuselage framework appear possible. This is a very interesting possibility for the manufacturer, because this process can be automated and production costs can be lowered.

Aircraft will thus become even lighter, more economical and efficient. This trend could be tracked clearly at the materials conference. This is a logical development trend, when one knows that a 1 percent reduction in weight results in a savings of more than 600 tons of fuel over 20 years of an aircraft's life, according to the comparison made by Airbus's top management executive committee. Mehdorn is figuring on a market of 14,900 aircraft for the next 20 years and called upon the suppliers to go after this more intensely and

to preserve the opportunities that arise from this. The Airbus industry would also, in the future, systematically profit from the economic and ecological benefits of the new materials.

German Role in European Space Program Discussed

92WS0293C Stuttgart FLUG REVUE in German
Jan 92 p 41

[Article by Goetz Wange: "European Space Program Remains in Further Doubt; No Decision on Hermes and Columbus"; first paragraph is an introduction]

[Text] Now it is a matter of limiting the damage in the European space program. The confusion goes on after the ESA Council of Ministers in Munich unshelved its decision for an additional year. The German delegation played an inglorious role.

It has been clear for around a year and a half that the ESA's long-range program with Ariane 5, the Columbus space station and the shuttle Hermes as its main elements is not realizable for the money that was planned in The Hague in 1987 (see table). German Research Minister Dr. Heinz Riesenhuber at that time had to bargain with his government without a clear budget commitment. His vote—the amounts budgeted for the long-range program had to be cut a total of around 15 to 20 percent—apparently remained unheard. Now a proper job had to be done at the ESA Council of Ministers meeting in Munich (November 18-20). The result was only a letdown: Work is still to go on in 1992, though with a budget reduced by 5 percent, and then the ESA Council of Ministers must meet once more in Madrid. What bright idea is to come by this time to those accountable has still not once been discernible in the amount budgeted.

Cost of the Most Important ESA Programs

Program	Financial Scope, the Hague (1987), in RE*	Estimated Total Cost, Munich (1991)	Remarks
Hermes	4.429 billion RE plus (economic conditions (EC) of 1986)	6.222 billion RE (EC of '86) to 7.32 billion RE (EC of '90)	+40.5%; 23% due to four-year extension of the program, and 17% due to technical changes
Columbus	3.713 billion RE plus (EC of '86)	4.239 billion RE (EC of '86) to 5.066 billion RE (EC of '90)	+14.2% due to extension of the program
Ariane 5	3.496 billion RE plus (EC of '86)	3.694 billion RE (EC of '86) to 4.371 billion RE (EC of '90)	+5.7% due to technical changes
DRS		897 billion RE (EC of '90)	Data Relay Satellite
POEM-1		929 billion RE (EC of '90)	
POEM-2		199 billion RE (EC of '90)	POEM-2 is a preparatory program
Columbus forerunner flights		282 billion RE (EC of '90)	Two Eureca flights, one Spacelab flight
*One RE (accounting unit) equals 2.07 German marks [DM].			

Hermes Not Till After the Year 2000 in Outer Space

New technical solutions that could make the program worth the money are not in the offing. The industry had already slimmed down in advance, and this simply went. The program's additional time extension also did not amount to enough. ESA's director general, Jean-Marie Luton, had banked on this above all for the Munich meeting. In his presentation he called upon the member countries to approve the second phase of the Columbus program. The plan called for putting into orbit the Polare platform and the docked Columbus laboratory (APM) in 1998, and the free-flying Columbus laboratory not till the year 2003.

This would suit well timewise the likewise delayed start-up program for the Hermes shuttle. Its maiden flight was designated for the year 2002 according to the new schedule, so that the first supply flight to the free-flying Columbus laboratory could take place in the year 2004.

The ESA proposal did not come to a vote. Because France and Germany had already advised it in advance

to postpone the decision to the end of 1992. The space program was declared a main concern a few days before the Munich meeting and therefore a subject of the talks at the meeting between Chancellor Kohl and President Mitterand. It was thereby clear what the result would be at the ESA council of ministers meeting. The little countries, that had definitely hoped for a clarification, finally agreed very reluctantly to the compromise. However, off the record they were not sparing with their criticism of the German course of action: Instead of laying the cards on the table within the ESA in time before the conference, the German delegation banked on "surprise tactics."

However, Minister Riesenhuber spoke of a success: "The German-French understanding was a good and helpful basis for the corresponding decision of the ESA council of ministers," he let it be said. He proudly stressed the German support by means of which an "environmental and climatic research mission unparalleled till now" has been set in motion. It is to take place in 1998 and make use of the Polare platform developed in the Columbus

program. The POEM-1 program (Program for Observation of the Earth and Its Environment) requires a total of DM1.8 billion. Germany will take on 22 percent of this. It will likewise not be decided before the end of 1992 whether it actually gets to the mission.

The share in the DRS communication satellite, by means of which the enormous flow of data is to be sent from the Columbus laboratory to the earth, was likewise agreed on at the brink of the council of ministers conference. Italy will lead the project and France will take on 20 percent and Germany 12.

The European aerospace industry must now see how it bridges the one-year last respite. The teams can hardly be supported without the use of their own resources.

Ariane Heavy Lift Booster Considered for Moon Flight

92WS0343A Stuttgart FLUG REVUE in German
Feb 92 p 31

[Article by Goetz Wange: "With Five Engines: Ariane 5 for Moon Flight?"; first paragraph is FLUG REVUE introduction]

[Text] An Ariane 5 rocket equipped with five engines and four solid boosters could transport three astronauts to the moon.

The Ariane 5, the future European carrier rocket, clearly must become more powerful, because without an increase in thrust, the European space shuttle Hermes, which is to be launched with it, would not be able to carry any astronauts to the free-flying Columbus laboratory. Through changes in the turbopump of the Vulcain engine, the force of this version, known as Mk 2, increases from 1075 to 1300 kN, and the capacity of the tanks for liquid hydrogen and liquid oxygen rises from 155 to 171 tons. The two large solid-fuel auxiliary rockets remain unchanged. The engineers have decided on this solution, and have abandoned a concept wherein the middle stage was equipped with two Vulcain engines. Still, that idea could be taken up again for a flight to the moon, but in that case as many as five structurally identical engines would have to be bunched together.

The starting point for the "Ariane heavy-lift" was planned by NASA to test the technologies necessary for a manned flight to Mars, initially on moon missions. If the Europeans are involved in this program, then the Ariane 5, which will have been adequately tested by then, could be used for part of the transport.

Planners with the French space agency CNES [National Space Studies Center] and its industrial partner Aerospatiale have based their scenario on the same type of mission used as the basis for Apollo: At the end of the 1960's, payloads of between 43 and 48 tons were launched with the Saturn 5 into a transfer orbit to the moon. The Ariane heavy-lift would have a potential of only 35 tons. However, that would probably be enough; significant advances have been made in the area of

materials and electronics, so that considerable weight savings are possible. On the one hand, a mission manned by three astronauts, including the lander and free-return vehicle, would be realized, while on the other hand 12 tons of cargo could be transported to the moon using the same transfer orbit, which is not the most economical one.

Compared to the Ariane 5 that is currently under development, this moon version would have a main tank for hydrogen and oxygen whose diameter would increase from 5.4 m to 7.5 m, thus allowing it to hold 620 tons of fuel. Five of the Vulcain version Mk 2 engines are mounted. The upper stage uses a reduced tank of the current Ariane 5 with a fuel capacity of 80 tons. A Vulcain also serves as the engine, although restartable and throttled to 60 percent. During liftoff from earth, four solid boosters from the Ariane 5 program support the middle stage. Each booster provides 600 tons of thrust.

Although components of the Ariane 5 are used, the heavy-lift version would not be cheap. Still, at an estimated 7 million German marks [DM], the development costs would be less than those of the basic version. Each launch of the "Ariane heavy-lift" would cost around DM500 million.

Regioplan Consortium To Develop 80-130-Seat Passenger Liner

92WS0343B Stuttgart FLUG REVUE in German
Feb 92 pp 43-45

[Article by Volker K. Thomalla: DASA [Deutsche Aerospace] Give Green Light to 80-130-Seater: Courage to Fill a Gap"; first paragraph is FLUG REVUE introduction]

[Text] In the coming days, Regioplan GmbH will be founded by Deutsche Aerospace (DASA), Aerospatiale of France, and Alenia of Italy. Its headquarters will be in Munich, and the goal of the company is to develop and produce a family of airplanes for the 80- to 130-seater market, under overall German control.

"We are well on our way for a program of this complexity, although we would have liked to have been a little further along on several points by the end of 1991," said Dr. Johann Schaeffler, executive vice president of DASA and chairman of the board of MBB, during an interview with FLUG REVUE. Regioplan GmbH, set up by Deutsche Aerospace, Aerospatiale of France, and Italy's Alenia, will develop a family of jets that is intended to fill the gap between small passenger jets such as the A320 or the Boeing 737-500 and turboprop commuters with up to 70 seats. Two models are aspired to within the framework of family planning: A basic Regioliner RL 92 model, with 87 to 109 seats, and an elongated version, the RL 122, with 117 to 144 seats.

DASA will assume overall control in Regioplan GmbH, and thus maintain a 50 percent investment. Alenia and

Aerospatiale are each assuming 25 percent. DASA estimates the development costs of the RL 92 and RL 122 at around \$2.4 billion. In keeping with its investment share, DASA must provide about half of the cost. However, the program is not dependent on support from the Ministry of Economics in Bonn; it must be commercially feasible even without state assistance. However, Schaeffler said, state support would lead to a lowered risk, and for that reason this issue is an important one. Feedback from Bonn on the program is reportedly positive, although such feedback cannot be equated with a promise of aid.

The burden of DASA's 50 percent should be distributed further, so that a 30 percent share remains in serial production. One potential partner being mentioned is China's CATIC, which was involved in the DAA/RL predecessor, the MPC 75. Its share would amount to around 5 percent. DASA would like to see Canada's Bombardier as a partner, whose holdings include Canadair and with which it has previously cooperated in other programs, such as the CL-289 reconnaissance drone. The Canadian investment could amount to 15 percent.

According to Schaeffler, cooperation with the Dutch manufacturer Fokker Aircraft will not materialize with the Regioliner, since both companies—Regioplan GmbH and Fokker—want to remain as front-line suppliers in the same market segment. Fokker, he said, is a well-known partner that is respected for its professionalism. DASA had a 27 percent share in construction of the Fokker 100 and is willing to guarantee with binding statements that the existing contracts will be honored. He said that the market is big enough for two suppliers.

Japanese Want Own Project

Schaeffler sees no competition between the planned Small Airbus A319—a truncated A320—and the Regioliner RL 122, both of which have a similar number of seats. The view in Bonn is similar, where people "have undergone a learning process." Regioplan GmbH will sell only around 50 to 70 fewer airplanes because of the A319, Schaeffler said. As a shorter version, the A319 is of interest to operators of an A320/A321 fleet as a supplemental airplane, he added. With regard to the A319, moreover, DASA is of the opinion that Airbus Industrie must prove that the airplane is economically feasible. A clear answer to this question has yet to be provided, according to Schaeffler. There has also been contact with companies in the number one economic power in the Far East, Japan. However, the Japanese want to fill the same market gap as an independent system supplier with a regional jet project, the 75-seat YSX-75B. But there are a number of companies from Asia in particular that are interested in the project, according to Schaeffler.

International Commuter Sales (ICS) is being set up as the marketing and customer service division for the companies involved in Regioplan GmbH, although it will not

be formally founded until the airplane is launched. Ultimately, it should not only sell Regioliners, but also handle marketing for the entire line of airplanes with between 20 and 122 seats offered by the three partners. This includes Dornier and ATR turboprops. All the partners are aware of the potential for conflict between an elongated Dornier 328 version and the ATR commuters. Schaeffler: "Both sides know that this question will come up, and are prepared to deal with it."

Technology Is No End in Itself

The number of new technologies to be realized in the Regioliner is still a topic of discussion. On the one hand, the question concerns how many new technologies are necessary, while on the other hand it relates to how much high-tech the airlines can afford. A technologically ultra-modern airplane that is beyond the airlines' means is not competitive. Schaeffler: "No one buys technology per se. Technology must make the airplane better and/or cheaper to operate."

Besides an ultra-modern cockpit with a sidestick and fly-by-wire controls, and a new low-resistance, high-extension wing, the technological goals center on the large-scale use of fiber composite materials. Decisions will be made over the next few months concerning which goals will be ultimately abandoned and which will be realized.

Of central importance to the direct operating costs (DOC) of the new airplane are the engines and their economic efficiency. In any event, the DOC of the Regioliner should be between 10 and 15 percent less than those of present-day 100-seaters. There are four different engine projects to choose from, none of which, however, has been implemented to date. All the candidates are turbofan engines with a high by-pass ratio which should excel in terms of environmental compatibility—low pollutant and noise emissions.

The DASA subsidiary MTU, together with U.S. engine giant Pratt & Whitney—but under MTU's system leadership—is supposed to make the PW/MTU RTF-180 a reality, which is planned to provide an output of 15,000 to 19,000 lbs of thrust. MTU will contribute its experience from the development of the EJ200 engine (for the Jaeger 90) to the design work.

BMW and Rolls-Royce are working on a family of turbofans in the thrust class between 10,000 and 22,000 lbs, known as the BR 700. The BR 715, with a fan diameter of 1.27 m and a power range of 14,000 to 22,000 lbs, would be a suitable engine for the DAA/RL 92. The core engine for the BR 700 family was launched in March of last year and should make its first run on the test bench in 1993.

Potential engine number three is the SNECMA CFM88-X project, which was known as the M123 until only recently and which the French manufacturer intends to implement with its U.S. partner of many years' standing,

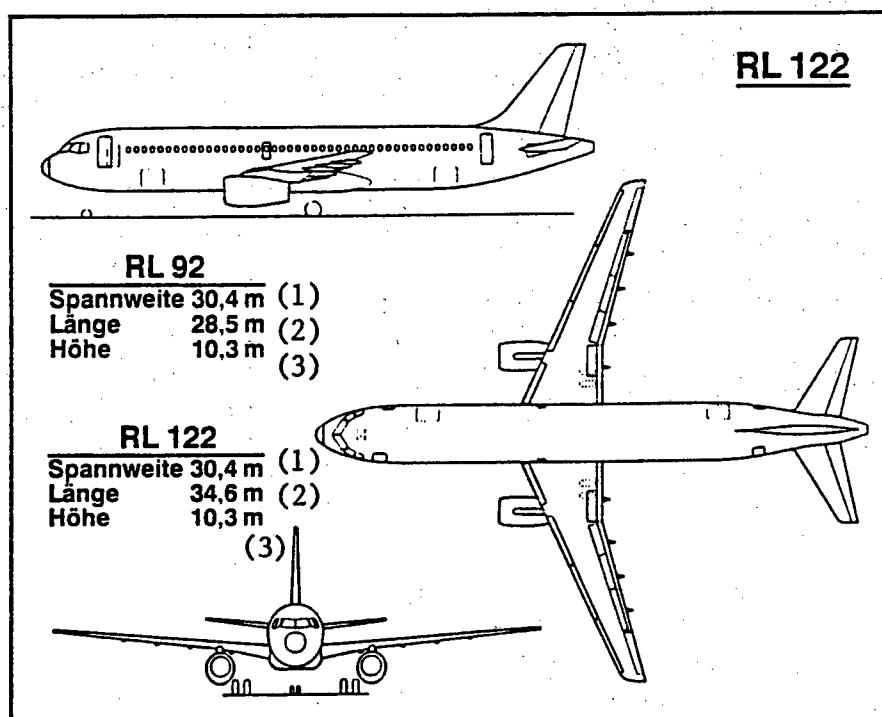


Figure 1. RL 122

Key: 1. Wing span 2. Length 3. Height

General Electric. Performance class: 15,000 to 20,000 lbs. A launch decision is expected before the end of the year.

Candidate number four in the 14,000- to 19,000-lb class is called the GMA 3014. It is based on the GMA 3007 engine for the Brazilian EMB-145 Amazon. The manufacturer is Allison Gas Turbine Division of Indianapolis, a subsidiary of General Motors Corporation.

Ultimately, the agonizing choice lies with the airlines, which must decide which engine they want under their DAA/RL 92. "As far as we can tell today," Schaeffler said, "all four of them fit under the Regioliner." In the end, however, there will probably be no more than two engine options, and it is necessary to see "which of the manufacturers is serious about supplying and realizing his engine." Another factor in the decision is the willingness of the manufacturers to sell the engines to Regioplane GmbH in dollars.

After the middle of the year, Regioplane GmbH will submit the first binding bids to the airlines for the RL 92. The Regioliner program should be officially launched with four to five representative customers. For Dr. Schaeffler, a good beginning would be a backlog of orders for 60 to 80 airplanes. The launch is expected for the fall of this year. Based on a development time of four years, the RL 92 could be approved in early 1996, and the larger RL 122 three years later, in early 1999.

According to a market study by Deutsche Airbus, there is a demand for 2,100 airplanes in the Regioliner class between now and 2009. Regioplane GmbH wants a big piece of this pie for itself; the targeted market share of 33 percent would be a sweet slice indeed.

France's CNES Studying Ariane 5-Derived Launchers

92WS0353B Paris AFP SCIENCES in French
6 Feb 92 pp 5, 6

[Unattributed article: "Launchers Derived From Ariane-5 Already Under Study"]

[Text] Paris—To plan ahead and meet the estimated needs for future large satellite launchings, at the turn of the century, the launcher directorate of the National Center for Space Studies (CNES) and manufacturers have been studying, for two years, the rockets that might be derived from the future Ariane-5 and its mechanical components.

On 23 January, after hearing Mr. Jean-Daniel Levi, the CNES general director, the Space Committee decided to start in-depth studies "before making a decision concerning the future development of the Ariane-5 family." The term "family" covers a series of rocket models developed since the inception of Ariane, 12 years ago, which have ensured Europe's presence in space and the success of Arianespace.

After the initial Ariane-1, there were six successive Ariane-4 models designed around the same basic central

body to which two or four strap-on powder- or liquid-propellant boosters were added, increasing accordingly the launcher carrying capacity into low or geostationary orbits.

The current Ariane-4 offered by Arianespace, in most cases to launch two satellites at a time, will be used until after the year 2000, giving Ariane-5 time to complete its first flight in 1995, then to confirm its operational capacities the following year, before launching the Hermes spacecraft on an unmanned flight in 2002, and on its first manned flight in 2003.

Two types of launches can be built with the mechanical components of Ariane-5: Light Ariane-Derived Launchers (DLA) designed around the powder-propellant cakes of the rocket strap-on boosters which can be stacked according to the mission selected to form two- or four-stage launchers; and Ariane-5 Mark-II, a rocket more powerful than the basic model.

The DLA-S version, designed for launchings into sun-synchronous orbits, is a four-stage rocket including an Ariane-5 P-230 booster (with 230 tons of powder-propellant) as a first stage, a P-85 booster with 85 tons of powder propellant as a second stage, a P-30 booster (30 tons of powder propellant), and a fourth 5-ton (L5) stage. It is thus possible to carry 3,500 kg of satellites up 800 km, into sun-synchronous orbit, or 5,000 kg into low equatorial orbit. A far more simpler version, the DLA-P, is obtained by removing the P-230 booster; it can carry 1,000 kg into polar orbit to an altitude of 1,000 km.

For Ariane-5 Mark-II, engineers have considered several possibilities, based on several objectives: To meet Arianespace's needs to compete against the General Dynamics Atlas-IIAS, which will be available in two or three years to launch 3.6 tons at 36,000 km; and to provide a launcher that could put a fully-loaded Hermes (at least 25 tons all together, including the aircraft) into low orbit. In the first case, to place two satellites each weighing 3.6 tons into orbit simultaneously, the present performance characteristics of Ariane-5 can be improved by adding 15 tons of liquid oxygen and hydrogen, lowering the joint bottom between the tanks, and improving the mixture ratio of the two gases.

To achieve the second objective, the performance characteristics of the single Vulcain engine located in the central Ariane-5 body can be improved by 20-25 percent. Thus, Hermes can be launched with its 3 ton payload and to an altitude of 36,000 km, it is possible to carry an additional 700-1,000 kg to achieve twin satellite launches with a weight increased from 5.9 to 6.6 tons.

This will require some alterations of the oxygen turbopump (increased flow rate), the propulsion chamber (increased pressure), and the divergent (to be made of three-ceramic composites). To increase the thrust, the turbine exhaust gases would also be supplied to the divergent.

"All our studies use an immutable parameter," an expert of the launchers directorate, in Evry, indicated; "none of the alterations contemplated can increase the launching costs submitted to Arianespace clients, nor those of the Hermes flights."

Landing Gear Specialists Form Research Group

92WS0354A Paris AFP SCIENCES in French
6 Feb 92 p 12

[Unattributed article: "Aircraft Industry: Creation of Eurogear European Economic Interest Group"]

[Text] Paris—On 3 February, the leading European landing-gear manufacturers—the French Messier-Bugatti (SNECMA group [National Company for Aircraft Engine Study and Manufacturing]), the British Dowty, the German Liebherr, and the Italian Magnaghi Napoli—formed a European economic interest group (GEIE) dedicated to research, Eurogear.

According to the four manufacturers' top executives, this new organization will present a research program on the landing gears of the future to the EEC. Their study will cover, among other things, the new materials that can be used and the weight gains that can be achieved.

The Eurogear members hope that their project will be among the 10 to 12 aeronautical projects that the EEC will select in May, and they will share the ECU50 million (350 million francs [Fr]) earmarked for the aircraft industry under the community program, Industrial Material Technology (IMT).

The budget they can expect (about ECU3 million) will represent one half of the total project cost; the other half will be provided by the manufacturers and their university partners. If the IMT program (1992-1994) fails, Eurogear might be "revived" for new programs contemplated by the EEC for the period 1995-1999, a Messier-Bugatti executive said.

The four partners pointed out that their intent was to perform basic research jointly rather than to form a partnership to develop the landing gear of a future aircraft, although in November 1991 the Messier-Bugatti management had hinted that the GEIE would develop the landing gear of the future Airbus A-350. The Eurogear members left open the possibility of using the research results jointly but, they pointed out, "they will remain free to develop their future landing gears together or separately."

The creation of the GEIE is of capital importance, Messier and Liebherr executives indicated, because "R&D costs in the sector are such that competing European companies must work together if they are to retain their ability to design and develop the equipment of the future." "The Japanese are an example of this type of cooperation," one of them added.

Although the GEIE members do not want to establish a hierarchy of their respective contributions, Eurogear will

be headed alternately by Dowty and Messier-Bugatti, the two leading European companies in the sector. Mr Graham Lockyer, the Dowty general director, will be the initial chief executive officer.

AUTOMOTIVE INDUSTRY

German Companies Developing Electric Car Batteries

High-Energy, Sodium-Sulfur Type Reviewed

92WS0279A Duesseldorf VDI NACHRICHTEN
in German 29 Nov 91 p 35

[Article by Ingo Reuss under the rubric "Energy": "Storage Battery Lasts in Use for Around 150,000 km; High-Power Battery to Replace the Gas Tank; ABB Plans Mass Production for Middle of the 90s"; first paragraph is an introduction]

[Text] Duesseldorf, 29 Nov 91 (VDI-N)—Increasing traffic density and growing environmental awareness are calling for mobility alternatives, especially in congested areas. Electric automobiles can reduce noxious emissions considerably. In order to be able to use high-power batteries to propel vehicles, they have to be, among other things, powerful, light and maintenance-free.

Energy storage devices are today looked upon as a key technology for bringing energy supply and demand together in time and space. For this reason BMFT [Federal Ministry for Research and Technology] has carried a third of the approximately 220 million German marks [DM] in development costs for the sodium-sulfur battery. It is now being made in an industrial prototype by Asea Brown Boveri (ABB). In so doing, ABB Hohen-ergiebatterie GmbH [High-Power Battery Limited Liability Company] is the only firm engaged in the manufacture of such a battery at this advanced stage. Dr. M. Mack, chief executive of the Heidelberg firm, even talks of a two-year lead over the competition: "Now about 500 batteries are being made per year. In the middle of the 90s, it will be 250,000 at a new production site to be constructed." While the project at the planning stage is already finished, a suitable place still has to be found, however. A selling price of less than DM500 per kWh is being aimed at in series production. That would mean that the price of the battery unit for a purely urban vehicle, having a power of 10 kW, would be about DM5000.

The sodium-sulfur battery's merits are obvious: It has quadruple the storage capacity, or energy density, of the conventional lead battery. This means a quarter of its weight and overall dimensions. Another important criterion is its life. The batteries now in use at ABB have in sum a total running time of 500,000 km behind them. A thousand charging cycles were repeatedly demonstrated in the prototype, but the goal is to be able to offer an equivalent general warranty, as Mack explains to VDI NACHRICHTEN.

Several firms are now working on various types of batteries and they are, to some extent, offering individual manufactured samples to the automotive industry. The U.S. automobile manufacturers are under particular time pressure. The so-called Clean Air Act calls for zero emissions, which requires from 1998 onward, cumulating every year, 2 percent of new car sales in the form of electric vehicles. The annual quota rises to 10 percent by the year 2003. In absolute numbers this represents 40,000 electric vehicles already in 1998 alone. For this reason the three big automobile companies—Ford, GM and Chrysler—are working together in a research group for the joint "development of advanced battery technology."

For the present, passenger cars equipped with high-power batteries have a distance range of about 150 km. They accelerate in seven seconds to the speed of 50 km/h pertinent to city traffic. Their top speed is about 120 km/h. Hitherto existing electric automobiles, mostly converted vehicles of the compact medium range, consume on average 25 kWh of power over 100 km. This costs about DM5 according to the electricity rate. When the battery is dead it has to be recharged for up to eight hours (for about 90 minutes with a quick recharging). This operation can be repeated about 1000 times, corresponding to a traveling range of 150,000 km.

There were a few stumbling blocks along the road to the production stage of the ABB battery. For instance, the reactants had to be as light as possible, offer high reaction energy, and be available without limit as raw materials, and at low cost. The elements sodium and sulfur could best meet these requirements. With a theoretical energy density of 760 Wh/kg, they surpass by around a factor of four to five the corresponding value for lead batteries.

The development of a suitable production process was another technical challenge. New ground had to be trodden here both with the ion-conductive ceramic and with the sulfur electrode or electric insulation of the cell. For example, there were problems ranging from fabrication precision because of process control to heat insulation. The operating temperature inside the battery is between 290 and 330°C, in order to maintain the liquid form of the reactants. Vacuum insulation was developed according to the principle of the thermos bottle in order to store the heat.

High-Voltage Lithium-Ion Cell Assessed

92WS0279B Frankfurt/Main FRANKFURTER
ALLGEMEINE ZEITUNG in German 7 Jan 92 p T3

[Article by Eberhard Seifert: "It Depends on the Battery"]

[Excerpt] Nonmetallic lithium, but lithium ions, are used in the lithium-ion battery research project introduced by Varta last fall. The anode consists of carbon and the cathode of transition metal oxides. The lithium ions travel back and forth between these thin electrodes.

A high cell voltage of 3.5 volts on average results at room temperature. Nickel-cadmium cells have a voltage of 1.2 V and lead or sodium-sulfur cells of about 2 V. The energy density of about 200 Wh/L is considerable, but the idea, as are many other similar developments, is still in the initial stage.

Peugeot Testing Assembly Robot

92WS0341C Paris *L'USINE NOUVELLE* in French
30 Jan 92 p 65

[Article by Stephane Farhi: "Assembly Robot Works Off-Line"; first paragraph is *L'USINE NOUVELLE* introduction]

[Text] Subassemblies will be directly mounted on the product. The aim is to automate the final assembly of automobiles and refrigerators.

PSA [Peugeot S.A.], leader of the ESPRIT [European Strategic Program of Research on Information Technologies] ARMS [Advanced Robotics Manipulation System] project is preparing the advent of a new production method: Robotized off-line assembly. The first robot prototypes, developed by Germany's Kuka, are presently being tested by Citroen Industrie, PSA's producer goods subsidiary at Meudon. Plans call for putting them into service on the assembly lines between now and 1993 or 1994. ARMS involves not just the automotive sector. Zanussi, Electrolux's Italian subsidiary and manufacturer of household appliances, also participates in the project.

Launched in 1989 and endowed with a sizable budget—70 million francs[Fr], half of which is financed by the EEC—ARMS aims to replace manual operations performed on assembly lines, with robotized off-line operations. The objective is to provide greater flexibility in the rate of advance of the assembly line, by assembling subassemblies in idle time. These will then only have to be mounted directly on the final product (which can be an automobile or a washing machine) without the need to interpose additional operations. The first application of the method will concern the assembly of automobile doors, particularly the installation of electrical wiring, which poses several difficulties. "Other subassemblies, such as the hood and dashboard, will be tackled later," says Pierre Saint-Joigny, who heads the project in PSA's Industrial Equipment Methods Department.

At stake is automation of the final assembly of vehicles. Less advanced than the automation of sheet metal production, which is now reaching its limits, it is nevertheless advancing steadily. This is particularly true as regards the fitting of the engine-transmission assembly to the body, the installation of mirrors, and the dismantling of doors that precedes the installation of interior appointments. The difficulty of the operation stems from the specificity of each assembly operation. Another major developmental parameter is the simulation of robotized operations to enable off-line programming.

A Close Collaboration

As for participants, ARMS has attracted a crew of top-flight performers. In addition to PSA, Zanussi's presence stems from its concern with problems of assembly that are comparable in both the household appliance and automotive sectors. Firms collaborating on the robotics of the project include Kuka, for the robot itself, and Telemecanique-Num for the control console, as well as specialists on control systems (robotics engineering unit of the CEA [Atomic Energy Commission], and of INRIA [National Institute for Research and Data Processing Automation]), on simulation (Tecnomatix), and on sensors (United Kingdom's AEA Technology, Belgium's Crif). Studies are aimed mainly at reducing the weight of the robot's and grippers' structures (using composite materials), so as to enable the use of direct-coupled motor drives eliminating speed reducers.

The team-up between the German robot manufacturer and the French automation equipment manufacturer is noteworthy. True, the two firms have occasionally collaborated in the past on joint business ventures in France. But Kuka generally uses its own control consoles or those built by Siemens. On the other hand, Num (with its Robonum 800) derives only 10 percent of its sales from this activity. Will ARMS provide Telemecanique an opportunity to enhance its product lines? At any rate the study being carried out under the ARMS project is using electronics cards that are also used in the 32-bit 1060 numerical control unit. And Num is currently preparing a robot control unit derived from the 1060.

PSA nevertheless maintains a prudent silence both on the technologies being developed under ARMS and on their planned use in production. Proof, no doubt, of the importance it attaches to them...

BIOTECHNOLOGY

Science, Industry Criticize German Genetic Engineering Law

92MI0292 Bonn *DIE WELT* in German
14 Feb 92 p 23

[Text] Science and industry have called for a considerable relaxation of the provisions of the law on genetic engineering, passed a year and a half ago, concerning the modification of the genes of living organisms.

At a hearing of the parliamentary committee on research and technology impact assessment, representatives of university and research institutes and industrial laboratories advocated primarily that a mere application procedure should suffice for nearly 80 percent of the projects currently subject to authorization.

These are projects falling under safety level one, defined by the law itself as the level where a "risk to human health and the environment" can be ruled out in any case.

This demand was also supported by the representatives of the Federal Health Office (BGA) and the Central Committee on Biological Safety [ZKBS]. The BGA representative pointed out that the immense workload that the authorization procedures for safety level one projects created would have adverse effects on the quality of the assessment of projects falling within higher safety levels.

The authorization procedure was generally criticized as being too bureaucratic. Professor Ernst-Ludwig Winnacker, head of the gene center at the University of Munich, described the effects of the law on his institute, which has a staff of around 250.

Blood samples, which must be kept at -80° for 10 years, are required for level two experiments, which have been routine to date in all advanced practical courses. This would entail annual costs of 5,000 German marks [DM], which would have to be met out of research funds. Practical experiments had, therefore, been discontinued.

Winnacker also maintains that the threat of fines up to DM100,000 for negligent conduct in the laboratory does little to attack new postgraduate students. Moreover, the genetic engineering law was an obstacle to scientific exchange with other countries because an author who published a scientific paper undertook to make the material from his research available to all his colleagues so that the tests could be verified and continued—often across national frontiers.

In most cases, however, this would constitute the punishable offense of "taking genetically modified organisms outside the territory covered by the genetic engineering law." If researchers are not prepared to do this, their work cannot be published. When they apply for posts later on, they do not stand a chance, because publications in international scientific journals are the most important criteria in competition between young researchers.

The Munich-based microbiologist Friedrich Deinhardt said that the law would place German scientists at such a disadvantage in international competition that in future they would either constantly lag behind developments or take their research abroad.

The German Association of Chambers of Commerce held the genetic engineering law responsible for the fact that German industry's plans for further genetic engineering production sites were focusing increasingly on areas outside Germany. The same applied to research and development.

According to the associations of the pharmaceutical and chemical industry, there are no findings anywhere in the world that could justify tightening up the existing safety measures in genetic engineering. However, Beatrix Tappesser from the Freiburg Ecology Institute called for increased public involvement in licensing procedures, a move that the Union of Public Services and Transport Workers also considers necessary.

Industry Criticizes FRG Genetic Engineering Law
92WS0349A Duesseldorf/HANDELSBLATT in German
13 Feb 92 p 7

[Unattributed article: "Genetic Engineering; DIHT [Association of German Chambers of Industry and Commerce]: Industry Is Shifting Planning and Setup of Genetic Engineering Production Sites to Other Countries; Specialists Demand Adjustments in Law"]

[Text] Bonn, 12 Feb—Numerous specialists demanded adjustments in the law and simpler approval processes during a hearing of the Bundestag Committee for Research and Health relating to experience with the Genetic Engineering Act, which has been in force since 1990. In particular, they said, the German law must be brought in line with EC guidelines.

The Association of German Chambers of Industry and Commerce (DIHT) was especially harsh in its judgment of the Genetic Engineering Act. The group charged that the law has caused a continuation of the tendency by industry to carry out the planning and setup of genetic engineering production sites abroad. There continues to be a greater concentration on foreign locations for research and development as well, the DIHT said. Only in the rarest cases can existing facilities be operated without problems, while in most cases the conditions that must be met are such that they are scarcely feasible in practice and in terms of competition.

In addition, the Genetic Engineering Act and the approval bureaucracy are hostile to small business, the DIHT said. Germany is not seeing the emergence of a startup situation with highly innovative and motivated young companies, as in the United States. Because of the legal and bureaucratic situation, small, established pharmaceutical companies are clearly coming out against incorporating genetic engineering into their long-term company strategy.

"Law and Bureaucracy Are Hostile to Small Business"

Moreover, the DIHT sees the effects of the Genetic Engineering Act "in a negative synergetic effect with other general conditions," citing the cost-dampening legislation in health care, tax burdens, labor costs, inadequate public acceptance of genetic engineering, and the status of molecular biology research in Germany. Against this background, the group said, the globalization of markets and worldwide cooperation in this field is a "one-way street" leading out of Germany.

The Chemical Industry Association (VCI), which submitted a joint statement with the Federal Pharmaceutical Industry Association (BPI), was also critical of the fact that the Genetic Engineering Act has meant a more than fivefold increase in the amount spent by companies on the application and approval process, without at the same time raising the safety standard of genetic engineering. In Germany, 80 percent of all work on genetic engineering is reportedly carried out with microorganisms or cell cultures in safety stage one.

According to current information, they represent no risk to humans and the environment, the groups said. For this reason, the chemical industry objects to situations where the application and approval process in this safety stage is delayed in individual Bundeslaender and decisions are made subject to additional conditions. Thus, the VCI and BPI called on the competent Land authorities to introduce simplified processes and uniform regulations for all Laender.

Position of Technology Center Threatens to Worsen

Further investment-inhibiting regulations would clearly worsen the basic conditions for Germany as a technology center, the associations warned. Besides the already apparent shift of genetic engineering research to other countries such as the United States and Japan, this would also result in the emigration of qualified scientists, the chemical industry fears.

During the application of European specifications, the DIHT expects to see infringements and contradictions in the national law that could raise questions about the entire Genetic Engineering Act in its current form. Individual changes in or additions to the German law clearly cannot be made when implementing the European specifications without affecting the other regulations of the Genetic Engineering Act and its ordinances, according to the DIHT.

Representatives of leading chemical and pharmaceutical companies such as Bayer AG or Karl Thomae GmbH said that there is no need to reenact the Genetic Engineering Act, although a "sub-legal, practicable procedure" is needed for the international exchange of specimens and in order to ensure uniform enforcement by the Bundeslaender.

Professor Ernst Winnacker of the Genetics Center at the University of Munich agreed with the other experts in calling for a relaxation in the processes for research projects in safety stages one and two, which relate to low-danger experiments. The records requirement should be satisfied in these cases by keeping ordinary lab journals, he said.

Wind Energy on German North Sea Coast

92WS0349B Duesseldorf *HANDELSBLATT* in German
11 Feb 92 magazine supplement pp 6-9

[Article by Joern Hons: "Generating Electricity on the North Sea: Windy Gold Diggers"]

[Text] Just behind the dike and in front of the first row of trees, the fresh North Sea breeze brushes past 10 shiny white, three-blade wind rotors. On a grain field in Wremen, north of Bremerhaven, modern windmills, visible from far off, loom 35 meters high and produce electricity. Wind power installations, which have experienced a long lull in this country since the failure around a decade ago of the "Growian" project, which had not yet been technically perfected, are now booming. In the

windy Land Wursten municipality, which includes Wremen, there is talk of a gold rush mood, and many villages would like to become the Klondike of wind energy.

Advanced technologies and materials have opened up new possibilities for exploiting the force of nature. Around the world, according to a recent WIRTSCHAFTSWOCHE report, there are currently 20,000 electricity-generating windmills in operation, of which the "wind power Mecca," California, accounts for 16,000. In Europe, it is primarily the Danes who are profiting from their windy location—with at least 3,000 installations. According to the German Association for Wind Energy, however, there will soon be as many as 2,000 electricity generators on the German coast, and the industry's order books are completely filled.

In Cuxhaven landkreis, a Bremen businessman is ahead of the game. His company, Windnutzungs-GmbH, in which the Bremen Department of Works has an interest, furnishes the electricity network with around 7 million kilowatt hours per year—enough to supply two-thirds of the households in Land Wursten, population 8,000. From the electricity supplier into whose network the wind power is fed, the company collects around 1.2 million German marks [DM]. With subsidies from the Federal Ministry for Research and Technology and the Land of Lower Saxony, the company plans to be operating in the black before long.

The municipal manager of Land Wursten is under a deluge of inquiries; the telephone rings every day, and talks and meetings on the subject of wind power dominate his work schedule. In the meantime, 11 locations for wind parks have been chosen. Especially in demand are sites in the first row, right along the dike. But even further inland, interested parties are also hoping to do good business turning wind into electricity. It is not the stiff breeze that is in short supply, but rather the space. Thus, planners are concerned about not planting masts all over the green marsh. On the one hand, all six villages want to profit from wind power, with six-digit tax revenues per year per wind park, while on the other hand the visual landscape—the O-Ton kreis administration: The "high visual vulnerability of our area, characterized by its linear nature"—should be preserved. However, a survey of coastal dwellers showed that the majority of them are not that narrow-minded about the issue.

The wind power entrepreneur is happy when the wind blows from the southwest or northwest at an intensity of between six and eight. In that case, his ten generators crank out 3,750 kilowatts of electricity an hour. The power plants are computer-driven. The computer controls not only the blades' angle of incidence, in order to make optimal use of the air flow, but also switches the operation of the individual propellers: When there is a relatively gentle breeze, only the mills facing the wind run, while the ones in the rear preserve their wear-prone parts. And all systems are shut off when wind intensity reaches 11.

Visible from the Wremen wind park is the looming, motionless "Monopterus," a little brother of "Growian" and in its day the largest single-blade wind power plant, extending 50 meters into the air—and awaiting demolition. In Bremerhaven, they called the single-blade installation the "one-armed bandit": The research rotor, which cost DM40 million, was always ready for the repair crew after only a few turns.

FRG: New Freezing Process To Store Microorganisms

92WS0351A Duesseldorf WIRTSCHAFTSWOCHEN
in German 14 Feb 92 p 94

[Article by Wolfgang Kempkens: "Live Pellets: Microorganisms Can Now Be Safely Frozen"]

[Text] The crystal clear liquid flickers like water just before it boils. But an ice crust on the upper surface of the small vessel indicates immediately that that off-the-cuff interpretation of what was happening was plain wrong. "It's liquid nitrogen," Juergen Buchmueller explains and ends the speculation. Buchmueller, a graduate engineer, is the specialist in charge of food-technology and biotechnology at Messer Griesheim GmbH in Krefeld. It is mostly living matter—cells, yeasts, and bacteria—that is deep-frozen in the gas specialist's low-temperature laboratory. Buchmueller's seemingly paradoxical aim is to drastically increase the microorganisms' chances of survival by means of an apparently barbaric treatment at a temperature of -176°C .

"Of course, you could just plop these tiny life forms into the liquid," Buchmueller says, pointing to the vessel containing the flickering liquid. But he prefers a new method because it is more effective. With his research team, he developed a machine from which small deep-cooled pellets (all with the same diameter) containing living matter, roll. Precisely controlled freezing is used to spare the cells, bacteria, and yeasts, which in this form—or freeze-dried—can also be easily transported.

Professor Guenter Gassen, who directs the Institute for Biochemistry at Darmstadt Technical University, raves about the process: "Cryopel technology will be just as important for storing life forms as the computer has been for data processing." Microorganisms, after having been frozen in this system, can be stored almost as long as desired before being restored back to life. Cryopel is a made-up word, derived from the Greek word for cold "cryo," and the English word for small spheres, namely, pellets.

The impetus to develop cryopel came from the Wiesby Laboratory in Niebuell in Schleswig-Holstein. The Wiesby bio-engineering company, among other things, cultivates starter cultures for the production of cheese and yogurt. The customers are dairy farmers in Germany and abroad. Initially, the Niebuell researchers simply dropped their sensitive products directly into the extremely cold liquid. They used to sprinkle the unevenly formed (sometimes large chunks, sometimes

tiny pieces) yeast with dry ice, which had a temperature of -78°C , and send them off on their way to the customer.

But the customers were not too happy about this. Too few cells could be revived. The lab team in Messer Griesheim set out on the search for a more life-protecting freezing process. The Krefeld process-engineers then developed an automatic machine, whose prototype still stands in the laboratory for test production.

Just recently the freezing specialists, working on contract for the giant Nestle company, processed a light brown liquid whose living microorganisms were not even known to the director of the experiment. The brownish substance was pumped into a storage container, whose contents could be precisely monitored down to the millimeter. Owing to the force of gravity, the brownish stock streamed through countless holes in the bottom of the container that terminated in fine nozzles. The nozzles were so designed as to form droplets of identical size, which eventually dropped off. Owing to surface tension during their fall, they formed into perfectly round pellets. In this state, they were quickly immersed in a liquid nitrogen bath. All the time, a constantly sweeping comb was immediately removing the pellets, which were deep-frozen in fractions of a second, from the bath. They then trickled down into an insulated container.

In this state of forced hibernation, the tiny life forms are delivered to their insulated containers. The Niebuell yeast-growers' customers have every reason to be happy. The survival rate of the cells rose from 15 to 20 percent. And shipping the product is made even simpler, when the cold pellets are then freeze-dried as well.

Six experimental facilities and four permanently installed cryopel machines are already in operation. Besides the food industry, the producers of pharmaceuticals appear most interested in the new freezing technology. The Behring Plant in Marburg, like Messer Griesheim an affiliate of Frankfurter Hoechst AG, has found the most remarkable application. The bio-engineers in the laboratories on the banks of the Lahn developed a process to produce the enzyme Factor XIII, which greatly speeds up the healing of wounds, with genetically-engineered yeast cells.

In order to derive the preparation, the yeast cells have to be destroyed. The destruction takes place mostly in so-called "pellet mills." However, heat, which can destroy the preparation, is generated by mechanical forces. A modified cryopel machine, call a cryozym because of its function, solved the heat problem. The ripened, enzyme-filled yeast cells are first formed into deep-frozen pellets, then, in that state, they are ground up.

Hoechst chose Japan, which is more open-minded to genetic engineering than Germany, where ever more

obstacles are being set up to thwart such work, to be the site for production. The facility, which assures Hoechst a world monopoly for Factor XIII, is currently in operation, initially, however, with a pellet mill. "Eventually," and Juergen Buchmueller is quite certain of this, "the cryozym will take over, and, eventually, will even be used by the producers of other genetically engineered preparations as well."

Genes Altered to Raise Alcohol Production From Wood

92WS0356A Stockholm NY TEKNIK in Swedish
30 Jan 92 pp 16-17

[Article by Birgit Andersson: "Yeast With the Right Effect"]

[Text] Yeast and gene technology. That is what lies behind a new biological method for producing ethanol from wood.

The biotechnicians who developed the new process work at the Chemistry Center in Lund and the laboratory results are promising.

"We can increase ethanol yield as much as twofold," the researchers said.

The principle is based on producing ethanol from xylose, a type of sugar.

Xylose is currently a byproduct of sulfite-based liquor production and so far no one has been able to utilize it for industrial alcohol production.

"A terrible waste," said Professor Barbel Hahn-Hagerdal of the division of technical microbiology at the Chemical Center in Lund.

In her hand she held a flash containing toxic brown sulfite waste liquid from wood.

"It would be very stupid of us to fail to make use of these cellulose fibers that nature has gone to so much trouble to produce," she said.

"No one today is foolish enough to burn oil without distilling it and this wood can also be distilled," said Hahn-Hagerdal, putting down the waste liquid she obtained from MoDo in Ornskoldsvik.

Ordinary Baker's Yeast

Today the Ornskoldsvik plant supplies fuel for Stockholm's ethanol buses and produces the alcohol with the help of traditional fermentation methods.

This means they use ordinary baker's yeast which ferments part of the sugar in the waste liquid into ethanol.

The baker's yeast is unable to ferment the remaining sugars in the liquid, such as xylose, for example, into alcohol and thus the ethanol yield is only half of what it might be.

For 10 years research groups around the world have tried to produce ethanol from xylose obtained from wood with the help of biological methods.

Among other things they have transplanted a bacteria gene that gives the code for breaking down xylose into yeast fungi.

But the gene did not succeed in getting the host organism to produce ethanol.

No Bacteria

At the Chemistry Center in Lund Hahn-Hagerdal and doctoral candidates Johan Hallborn and Mats Walfridsson have now solved the problem in a new way.

Instead of using bacteria the group is working exclusively with various types of yeast.

"Our new gene-manipulated yeast can increase ethanol output by 25 percent, in some cases as much as 50 percent," Hahn-Hagerdal explained, pointing to the bundle of wood she had put in a vase on the table.

The gene which the research group has now succeeded in isolating, sequencing and inserting in ordinary baker's yeast, *Saccharomyces cerevisiae*, comes from the yeast fungus *Pichia stipitis*.

This newly-inserted yeast gene gives the code for the enzyme xylose reductas.

Xylose reductas has the ability to transform xylose into xylitol and the gene was produced with the help of target-seeking antibodies grown in rabbits.

Obtaining xylitol from xylose is the first step in the ethanol process and this is the point the biotechnicians in Lund have reached today.

The next step will be to insert another yeast that gives the code for the enzyme xylitol dehydrogenas.

This enzyme turns xylitol into xylose.

In a final step the yeast xylose is turned into ethanol. (See illustration [not included, captions below].)

Today the group has succeeded in isolating both genes and in six months they will be in place in the new Lunda strain of baker's yeast.

Metabolic engineering is what this form of gene transfer is called, meaning that scientists step in and alter the yeast's metabolism.

The yeast will work year after year and the new genes will be transmitted from generation to generation in the new host organism.

Are there any risks involved in a gene-manipulated yeast of this type? For example can it attack all the wood in its vicinity?

Or is there a risk that the morning paper will disintegrate one day on the kitchen table? Someone might dump the yeast out in the sink by accident.

"No, there is no risk of that," Hahn-Hagerdal assured us. "This yeast lacks the enzyme for breaking down pure cellulose. Our organism works only in its special environment... And experiments like this are not carried out without being followed up very carefully."

In six months a total laboratory process will have been completed at the Chemistry Center, but Hahn-Hagerdal has no idea if and when the gene-manipulated yeast will come into industrial use.

"As a scientist it is my job to develop new methods. Industrial application is not my department," she said. But she thinks interest in wood-based ethanol will increase.

"Interest follows the price of oil and of course greater environmental awareness will also increase future demand for renewable fuel."

And the interest is there.

Support for Project

The project is partly financed by various funding authorities in Sweden, the business sector and the wood industry.

MoDo and the Nordic Industrial Fund are examples of active contributors. Nutek, the Business and Technology Development Agency, is another source of funds.

The main cooperative partner is the VTT Biotechnical Laboratory in Helsinki.

Both Hallborn and Walfridsson went through part of their research training there.

"The Finns know yeast genetics and we know yeast physiology. Together we are now developing a practical industrial yeast technique," Hahn-Hagerdal said in conclusion.

Illustration Captions (p 16)

Fermenting wood with gene-manipulated baker's yeast gives up to twice the amount of ethanol when xylose can be fermented.

1. All the genes from the yeast *Pichia stipitis* are cultured in bacteria in an agar dish. The two desired genes are obtained with the help of target-seeking antibodies.
2. The genes are cut out and glued into a bearer molecule (plasmid).
3. The plasmid is implanted in baker's yeast.

ENERGY, ENVIRONMENT

German Refrigerator Disposal Plant Enters Service

92MI0310 Wuerzburg UMWELTMAGAZIN
in German No 1-2, Feb 92 p 56

[Text] A new refrigerator plant, according to its operator the most modern in Germany, entered service a year ago in Hoevelhof, Westphalia. It dismantles and disposes of 100,000 scrapped appliances a year without damage to the environment. This is roughly the same number of refrigerators as are thrown out every year by about 3.5 million households in the Federal Republic of Germany. The private disposal company Toensmeier Raw Materials has invested around 3.5 million German marks in developing and building the new plant. It is a further development on the first "Kentec" plant, which Toensmeier Container Service GmbH has been operating in Hameln since 1989.

Chlorofluorocarbons (CFC's) are still being given off into the atmosphere every day and are destroying the ozone layer in the stratosphere. There are 1,600 tonnes of CFC's just in the cooling circuits and insulating materials of the 2.5 million or so refrigerating appliances that have to be disposed of in the Federal Republic of Germany every year. The aim is to recycle these CFC's as completely as possible.

Toensmeier Group specialists have developed and patented a special technique for refrigerator disposal. This "Kentec" process can be used to reprocess not only liquid coolants, but also the plastics, rubber, glass, metals, motors, electric cables, mercury switches, and foaming agents used in refrigerators.

To facilitate syphoning off the coolant, the refrigerators are first stored at at least 5°C. Then the machine oil and coolant are removed with all due care from the cooling circuit. "This is the first time that used oil and CFC's have been collected separately. Both materials can then be processed and reused by the manufacturer," explains Juergen Toensmeier, the group's managing partner.

The disposal specialists have also developed a process suited to ammonia-operated refrigerators: Ammonia is drawn out of the cooling circuit under pressure. The next step in dismantling them is to remove the motor and glass panels. The motors go to metal and scrap dealers for reprocessing.

No CFC's Spread Into the Environment

The refrigerators then pass through a man lock into a low-pressure chamber. They are then reduced in two stages to pieces the size of five-mark coins. The CFC gases contained in the refrigerators' insulating material are released in this process. They are filtered and 100 percent drawn off into a liquefaction plant. The advantage of this process is that pure CFC's are recovered. No gases enter the environment.

The mixed metal and plastics are subsequently separated from one another in three stages. First of all, the Hoevelhof plant recovers ferrous and nonferrous metals separately: A magnet is used to extract the ferrous metals. Next, nonferrous metals such as lead, aluminum, and copper are separated from the polyurethane foam using a whirlpool separator. "By differentiating between ferrous and nonferrous metals, we can recover more metal in Hoevelhof than in the Hameln plant," Toensmeier emphasizes. "At present the polyurethane foam is still dumped, but we aim to be able to reprocess that as well."

Safety at Work Is the First Concern

Five measuring devices have been installed to protect the 15 employees who work, in two shifts, at Hoevelhof. An optical and acoustic signal warns them as soon as the CFC concentration reaches 5,600 mg/m³. Two sensors in the "treatment room" provide additional security, establishing in good time whether gaseous substances are entering the environment.

"As disposal specialists we are increasingly dismantling factories for the manufacturing industry. Refrigerator reassembly can already be run as a normal production process," says Juergen Toensmeier of one aspect of the disposal company's work.

For example, one large delivery firm takes customer's old refrigerators away when a new one is delivered and has them disposed of in the new plant.

France: Environment Ministry Present Waste Management Plan

92WS0328C Paris AFP SCIENCES in French
23 Jan 92 pp 38-40

[Article entitled: "A Ten-Year Plan to Solve the Problem of Household and Industrial Waste in France"]

[Text] Paris—Following the cabinet's adoption on 22 January of the plan presented by the environmental minister, Brice Lalonde, all household and industrial waste in France will be treated, eliminated, value-added, or recycled within 10 years.

Said Prime Minister Edith Cresson: "I would like to insure that, 10 years from now, no French man or woman ever again suffers from the nuisances produced by our current waste-management policy. Within five years, we will have cleaned up the 100 areas of blight that have been counted. Within 10 years, we will have eliminated the 6,700 waste dumps, which accept waste indiscriminately. Also by that date, all waste will be treated, eliminated, value-added, or recycled. The program will cost the equivalent of one franc a week per inhabitant."

The 10-year plan that the minister of the environment presented covers the 20 million metric tons of household garbage, the 30 million metric tons of common industrial waste, and the 18 million metric tons of special industrial waste that have been inventoried. According to Mr.

Lalonde, who was cited by the government's spokesperson, the plan should create 10,000 jobs in an industry that currently employs 100,000.

A specific research program will eliminate highly radioactive waste, said the minister. It will be staggered over a 15-year period and cost 11 million French francs [Fr], in conformance with the 30 December law.

Mr. Lalonde has identified three broad areas of action:

- First, the plan will mobilize all those concerned. Each French territorial department will draft plans to eliminate waste grounds. Communes which agree to accept the necessary plants will be compensated. Packaging will be recycled: Towns such as Dunkerque, La Baule, Lons-le-Saulnier, and Chambéry have already agreed to act as pilot cities for the recovery of packaging waste.

There are plans to create 160 intercommune plants to treat the waste, and only the residues from those treatments will be storable in the specialized centers. With regard to special industrial waste, each region will draw up plans to manage it, plants will be built to eliminate it, and loans will be made available to develop new techniques to handle it.

Second, efforts will be made to restore the population's confidence in waste treatment, through consultation and open decisionmaking. Inspection of cross-border shipments will be stepped up, to prevent the import of waste from neighboring countries. Storage sites will be improved, and much stricter safety rules will be implemented.

Third, the government will free up the necessary funds. Research will be expanded: The Environmental and Energy Control Agency will present a full program for a "strategic, EUREKA project" in the spring. A Waste Management Modernization Fund created within the Environmental Agency will provide a new mechanism for funding. It will be paid for by a fee levied on deposited waste.

Here is the text of the communique that was published on the environmental plan at the close of the cabinet meeting:

"The environmental minister presented a report on waste policy.

Each year France produces about 70 million metric tons of household and industrial waste, but insufficient treatment facilities make it difficult to eliminate them. A comprehensive program to renew our waste policy has been approved. Its objectives are ambitious:

- The 6,700 traditional waste grounds that accept ordinary household and industrial waste without prior treatment will be eliminated within 10 years;
- 160 intercommune treatment plants will be created to treat this waste, and only the residues from those treatments will be accepted for storage in specialized centers;

- a system for recovering packaging materials will gradually be instituted;
- the 100 known "blight areas" used to store special industrial waste will be cleaned up within five years;
- in conformance with the law of 30 December 1991 on research into radioactive waste management, a 15-year research program costing Fr11 billion will study methods for eliminating highly radioactive waste.

1—A waste-management modernization fund will be created within the Environmental and Energy Control Agency. It will be paid for by a fee on traditional collective waste grounds, levied at the rate of Fr20 per deposited ton. The industries concerned by special industrial waste have proposed making voluntary contributions to support a renewed waste policy. If the representatives of those industries and the Environmental and Energy Control Agency reach a multiannual agreement on such a contribution within the next two months, special waste will be exempted from the fee.

2—For ordinary household and industrial waste, the fund will help to create new, intercommune waste-treatment plants and to rehabilitate waste sites. It will also provide financial incentives to communes which agree to accept the plants within their borders.

As of 1 January, 1993, producers and importers of consumer products for the general public will have to recover their packaging. They can either do this themselves—by depositing them for instance—or contract with a special organization that will work with communes to recover the packaging during regular collection of household garbage.

As a complement to the current regulations on special industrial waste, importing household garbage for consignment to waste grounds will be prohibited.

3—For storage of special industrial waste, the fund will help eliminate areas of blight and improve the safety of storage centers.

The rules governing the storage of special industrial waste will be strengthened to insure safety. Each company will have to commit to reducing the volume of its waste, just as it respects the limits on atmospheric emissions or the discharge of waste products into water. The state will see to it that communes which accept special-waste treatment and storage centers within their borders receive equal compensation for doing so.

Basin funding agencies now spend Fr100 million a year treating special industrial waste. The government's decision last June to allow them to double the amount they spend on cleanup programs will enable them to step up their assistance.

4—The National Agency for the Elimination of Radioactive Waste will keep an up-to-date inventory of such waste. The laws regarding the storage of low-level radioactive waste will be clarified.

5—The Environmental and Energy Control Agency will prepare a waste research program spanning several years for next June.

The legislative measures needed to implement this program will be the subject of a bill that will be submitted to Parliament during spring session.

Development of Geothermal Energy in East Germany

92WS0331B Munich SUEDEDEUTSCHE ZEITUNG
in German 30 Jan 92 p 49

[Article by Martin Schneider: "Heat That Comes From the Deep"]

[Text] Just as in the times of the GDR, after German unification the brown coal clouds hang heavy in the air over the cities in the east. Waren am Mueritzsee in Mecklenburg is no exception in this context. Only in Erich-Weinert Street is it easier to breathe. Here, 806 apartments are being heated with 60° water from a depth of 1,500 meters.

Primarily because of the chronic lack of foreign currency, the GDR invested in clean heat from the depth of the earth. In addition to the facility in Waren, during the 1980's two more power plants, which deliver a total of 22 megawatts of thermal power, were built in Prenzlau and Neubrandenburg. This has made it possible to save more than 26,000 tons of brown coal so far. Plans and explorations for additional sites had progressed so far that by the turn of the century 300 megawatts were to supply comfortable heat in Eastern German apartments.

Positive 'Old Burdens'

In order not to squander the opportunity of getting a positive "old burden" from the GDR in this environmentally beneficial form of energy, the Federal Research and Environment Ministry has decided to use three facilities to demonstrate that geothermal energy can also be used economically. Potential sites have been discussed for months, and the decision is to be made in February.

Four and a half billion years ago, enormous quantities of dust and gas contracted in the universe. The gravitational energy was thereby completely transformed into heat and enabled the creation of a fire ball—our planets. This glow continues to live in the earth's interior. More importantly, however, it is constantly fanned by the decomposition of naturally radioactive isotopes—primarily uranium, thorium and potassium. The heat contained in the upper 10 kilometers of the earth's crust alone would be sufficient to operate a million 200-megawatt power plants for 10,000 years.

Theoretically, at least. But initially, Mother Earth has to be enticed to give up her heat. Until now this has taken

place exclusively by "hydrothermal" means, by using hot water or steam from deep down. This is particularly profitable in tectonically active areas, where magma chambers extend far up under the surface and heat the water to several hundred degrees. While normally the temperature increases by 30 degrees for each kilometer of depth, in Iceland, for example, temperatures of 1,000 degrees are already found at a few hundred meters.

If the water is hotter than 150°C, it can be used for power production. About 6,000 megawatt electric power is produced worldwide in this manner. The oldest geothermal power plant is located in Larderello in Italy, 40 kilometers southwest of Siena. The first generator was hooked up to the power grid as early as 1912. The largest producer of "geopower," with a world share of more than 40 percent, is the United States. "The Geysers" geothermal field delivers most of the power for San Francisco. In "geologically more modest" areas, the water is not hot enough to produce power. In some places it can be used for heating purposes, however—as in Waren, Prenzlau and Neubrandenburg. Hot water is pumped from an aquiferous sandstone layer at a depth of 1,500 meters to the surface. Then it is not fed directly to the heating elements, however, but first conducted through a heat exchanger before being pumped back into the deep through a second drill hole. The reason for this is that it cannot become a burden on the waterways due to the often very high salt content. Furthermore, there is danger that the water-carrying layer could be pumped dry from production rates of more than 50 liters a second.

With a total of 33 megawatts from 20 plants, the German share of the 11,000 megawatts of installed geothermal heat production is quite modest, to be sure. In the Paris basin alone, 61 thermal power plants supply more than 200,000 homes with heat from the deep and save approximately 200,000 tons of oil annually. Here, as well, thermal heat could be used more than up to now. Studies by the Lower Saxony Regional Soil Research Office has demonstrated usable aquiferous strata primarily in the northern German lowland, the southern German soft tertiary sandstone basins between the Danube and the Alps and in Oberrheingraben. The communities in the East, in particular, have the best preconditions for continued expansion of geothermal energy. District heating networks are extensive and the power plants have to be replaced urgently anyhow. "From the times of the old GDR there are many drill holes in Mecklenburg-West Pomerania which can be used immediately," reports Ruediger Schulz of the Lower Saxony Regional Office, "but the problem is that the gas suppliers often beat us to it"—and threaten to cut the ground from under geothermal heat.

So far, however, many cities in the northeast of Germany are interested in geothermal heating. "Everything is waiting for a decision by Bonn as to which plants will be modernized or rebuilt," says Frank Kabus of Geothermie Neubrandenburg GmbH. After being postponed several times, it will now finally get a green light in

February. Franz-Josef Schafhausen, in charge of geothermal energy at the Federal Environment Ministry, explains why the mills of bureaucracy grind so slowly in this area: "First we have to wait for the result of an economic-ecological study; after all, no one is served by a hasty site determination, which shortly afterward turns out to be wrong because it is not economical." On no account does one want to create new "subsidy pits."

Since geothermal heat involves no costs for fuel consumption but instead large investments for drilling, profitability is not as easy to calculate as for other fuels. Utilization of geothermal heat is also not entirely without problems. The problem child for operators is above all the high salt content of most thermal waters—in northern Germany up to 290 grams per liter. This causes the pipelines to corrode. Further, the water is able to release less salt due to the cooling, so that it precipitates, clogs the pipes and in some instances has to be removed and disposed of. In Mecklenburg, however, it is largely a matter of unproblematic table salt.

The major part of the geothermal power cannot be hydrothermally developed, however, since it is stored in dry rock at the deeper levels of the earth's crust. Under our feet as well there are temperatures of at least 200°C at 7 kilometers' depth. But this energy could be used with the so-called "hot dry rock" (HDR) method in Germany as well.

Rock as Flash Heater

The HDR method uses the "hot dry rock" as a gigantic flash heater. By means of injection drilling, cold water is pressed far down under high pressure. This produces cracks and fissures—a method known for 40 years as "hydraulic fracturing." In a second drill hole one tries to hit this crack—and the circulation system is complete. Cold water can then be conducted through the first drill hole into the earth, be heated in the cracks and crevices and subsequently be brought to the surface through the second drill hole in order to drive a turbine. European researchers intend to decide, even this year, concerning a site for a pilot project for an HDR facility. Under consideration are Bad Urach, Soultz-sous-Forêts in Alsace or Cornwall in England. But even in optimistic evaluations it will be another several decades until this technology is ready for practical application.

EC, Japan To Cooperate in Environmental Matters

92WS0352B Brussels EUROPE in English
18 Jan 92 p 8

[Article: "Reinforced Cooperation in Environment To Reduce CO₂, Protect Rain Forests, Improve Nuclear Safety"]

[Text] Tokyo, 17 Jan 92 (AGENCE EUROPE)—A top-level meeting between the European Commission and the Japanese Government on environmental cooperation was held on 16-17 January, with the two delegations

being led by Director General Mr. J. Brinkhorst and Deputy Foreign Minister Mr. Koichiro Matsuura. The results were positive, because it was agreed to reinforce cooperation in the following areas:

- tropical rain forests—Japan will participate (a quasi-promise, Mr. Brinkhorst said) in the international fund to save the Amazonian forest, and the EC will contribute to funding the project for balanced management of the Sarawak forest in Malaysia;
- stabilization of CO₂ emissions—The EEC and Japan will make similar commitments at the Rio Conference;
- nuclear power plants—The two parties will cooperate in the safety of nuclear plants, especially in Eastern Europe and the former Soviet Union.

Two joint working groups have also been created for the management of some 100,000 chemicals currently marketed in the world and for the study of industry/government reports on the environment.

EC Report on Health of European Forests Presented

92WS0352C Brussels EUROPE in English
20-21 Jan 92 pp 11-12

[Commission Report on the Health of European Forests in 1990 Notes That Slow But Uneven Deterioration Continues]

[Text] Brussels, 20 Jan 92 (AGENCE EUROPE)—The European Commission has just released its third annual report on the health status of the EC's forests. This document, available as an executive summary and a technical report, contains the results of the 1990 EC forest health survey and of national forest health reports. It points out variable results and, for certain species, a continuing deterioration.

In 1990, the EC enlarged following German reunification and the forests of the former GDR were also included in the survey. For the first time, additional data were also evaluated in this context from five non-EC countries: Austria, Czechoslovakia, Hungary, Poland and Switzerland. The results of the report as a whole indicate that a significant part of the forests in the Community show signs of defoliation or discolouration. From year to year, this vitality situation of the forests has fluctuated considerably, but for certain species a pronounced deterioration has been observed. In the 2005 plots of the 1990 survey in the Community, a total of 15.1 percent of the trees showed clear indication of leaf—or needle-loss (defoliation more than 25 percent). Trees showing more than 10 percent discolouration represented 14.4 percent of the tree sample. For the most common species groups in the Community—spruce, pine, oak, and beech, the percentage of damaged trees were in the order of 10 to 20 percent. However, the eucalyptus showed the lowest percentage of damaged trees. Damage was most severe among the Cork Oak.

As a general rule, a certain deterioration in forest health occurred over the entire Community between 1989 and 1991. The overall vitality decreased slightly for all species. Only in the oak did the health status remain constant.

Moreover, there is a major problem in separating changes in crown density or coloration attributable to pollution from those caused by other factors. However, cause-effect studies indicate that air pollution in many cases play a significant role in forest decline. In Eastern and Central Europe, air pollution is considered to be one of the most important factors affecting forest health, whereas in the rest of Europe it is considered to be one of the factors predisposing forests to decline.

EC: UK's Environmental Priorities Outlined

92WS0352E Brussels EUROPE in English
23 Jan 92 pp 9-10

[Article: Ripa Di Meana/Heseltine Meeting on the Future British Presidency—France Expected To Unblock Entry in Relation to the European Environment Agency—Priorities and Guidelines“]

[Text] Brussels, 22 Jan 92 (AGENCE EUROPE)—On Tuesday the British Minister for the Environment, Michael Heseltine, met Commissioner Carlo Ripa di Meana for a meeting in preparation of the forthcoming British Presidency of the Council (second half of this year). At the close of the meeting, Mr. Heseltine insisted upon the urgency and the need for the European Environment Agency to come into operation and stated that he hoped the French Government “would understand” this need felt by Europe. He deplored the French Government's tactic to block the decision on the Agency's seat by establishing a link with the seat of the European Parliament.

The minister presented to the commissioner an informative document entitled: “The Environment and Europe: A Look Ahead.” From the beginning, the document gives a positive assessment of the new title “Environment” contained in the Treaty on European Union. The text, such as it was, approved in Maastricht, is a “success” for this policy according to the minister who feels that, despite the 300 Community measures already in force, considerable work is still to be done over the coming years in order to complete and also—as it sometimes proves necessary—to make them more coherent. The British Presidency wishes to buckle down to the task, by getting priorities right: “Everyone wants a cleaner world. This costs money. But our resources are limited.”

The document then presents the views and objectives of the future Presidency:

- a) it is urgent for the European Environment Agency (the creation of which was decided by the Council but which cannot operate until the seat has been decided upon) to be set up very soon. The EC's credibility is at stake, wrote Mr. Heseltine who asked the Commission to submit proposals allowing work to be carried forward as soon as possible.

Mr. Heseltine felt that Europe, including Central and Eastern Europe, needs an independent body that can speak authoritatively on the state of the environment throughout the continent, how it is changing and where the main problems are arising. It would also assess the work of agencies charged with supervising the application of environmental legislation at national, regional or local level. Taking up the idea set out by the Dutch Presidency on an information exchange network between the different agencies controlling pollution in member states, the United Kingdom will, during its Presidency, organise a meeting of inspectors from these agencies.

b) the Commission must ensure that the principle of subsidiarity is fairly applied. This would prevent it from having to call too much upon its resources and will contribute to improving the quality of the preparation of Community initiatives and their possible adoption as regulations;

c) as the Commission has the own initiative right to put forward proposals which affect the 320 million EC citizens, these proposals should be based on sound science and clear, accepted principles and should take into account the economic, social and environmental consequences of their application. The draft framework programme on environment, shortly to be presented by the Commission, will be a major test of the Commission's capacity to meet such necessities, feels Michael Heseltine. The minister also said he was willing to work in a closer way with the European Parliament;

d) the practice of "Green Papers" pursued by the Commission in order to give rise to debates before formalising its proposals should be consolidated. The experts from member states and industry, consumer representatives and those of environmental conservation associations must be associated from the very beginning to the preparation of Commission proposals;

e) priorities must be carefully chosen as the member states do not have unlimited resources available and industry must be able to adjust to the new norms while remaining competitive;

f) the Presidency will follow with interest the way in which the Commission plans to implement the provisions of the European Treaty of Union which stipulates that environmental protection should be incorporated into the other EC policies.

EC Position at Upcoming UNCED '92 Conference Outlined

92WS0352J Brussels EBIS—EUROPEAN
BIOTECHNOLOGY INFORMATION SERVICE
in English Dec 91 pp 3-5

[Text]

A Basis for EC and Member State Positions

The Commission has sent to Council a 50-page communication entitled, "A Common Platform: Guidelines for the

Community for UNCED 1992," which is intended to serve as a basis for the formation of agreed positions for the Community and its member states.

UNCED '92: UN Conference on the Environment and Development

The United Nations General Assembly in its resolution 44/228 of December 1989, concerned at the continuing deterioration of the state of the environment and degradation of global life support systems, formally decided to convene a UN Conference on the Environment and Development (UNCED), to be held in Brazil, June 1992. Amongst its overall aims for sustainable development, the Conference has to make recommendations on effective modalities for favourable access to and transfer of environmentally sound technologies, and for efforts to develop endogenous technological capacities.

European Council, Dublin, 1990: A Special Responsibility for International Action

The Commission, recalling the European Council's declaration at Dublin in June 1990, that "the Community and its member states have a special responsibility to encourage and participate in international action to combat global environmental problems," envisages that the Community should play a leading role at UNCED. In view of ongoing negotiations on climatic change and biodiversity, the current document does not deal with these issues, it reviews the global and regional threats to sustainable development. In OECD, Central and Eastern Europe, and developing countries (DCs), and the corresponding national and international responsibilities.

R&D Information on Environmentally Sound Technologies

Within the latter, the section on Research and Technological Development emphasises as an obstacle the lack of information about available environmentally sound technologies, and advocates steps toward:

- Bio-science Information Infrastructure. "The setting up of a jointly financed, easily accessible bio-scientific information infrastructure (BSII), including the necessary transfer of hard and soft technology to the DCs which will join the BSII; and a four-part declaration including several references to biotechnology and the applied life sciences;
- R&D Programmes: Involve Developing Countries in Biotechnology. Suitable Community R&D Programmes (notably those concerning Environment, Marine Sciences and Technologies, Agro-industry, and Biotechnology) will, where appropriate, open up towards developing countries in providing room for preparatory work in order to include joint research involving DCs at a later stage.
- Reinforce Existing Collaboration. Existing Community programmes for collaboration between European scientists and scientists from the DCs will be intensified to reinforce research on the environment and on matters of importance for the environment and enlarged to include

other areas of priority for development in addition to health and agriculture.

- Screen Plant Materials, Set Up Genetic and Phytochemical Databases. The Community will intensify its activities aiming at inviting researchers from developing countries to Community or member state research facilities for research of mutual interest (ways and means of environmentally benign products, setting up of databases for genetic and phytochemical data, etc.). The Community will encourage the world wide exploitation of results from its R&TD Programmes, which can have a beneficial effect on the environment."

Environmentally Sound Management of Biotechnology

Dealing with sectoral issues, the Commission paper devotes a page specifically to "Environmentally Sound Management of Biotechnology." The Community position proposed is:

- Exchange Information on Safety and Risk. "That UNCED should promote exchanges of information in the preparation of safety methodologies and to assist all countries to develop a coordinated approach to risk management and assessment with the view to preparing international regulations on the technology."

Regulatory Mechanisms and Appropriate Frameworks

As a first step, the Community should encourage all industrialised countries to adopt regulatory mechanisms and should assist DCs to develop an appropriate framework for the use of Genetically Modified Organisms (GMOs).

Risks of International Trade in GMOs; Prior Informed Consent

Similarly, UNCED should examine the setting up of mechanisms, and subsequently of an international agreement, to reduce the risks associated to international trade in GMOs. As a minimum, a prior informed consent procedure is necessary.

Proposed Community Position

In summary, the Community position should be:

- promote exchanges of information on all aspects concerning the sound management of biotechnology particularly on methods for risk assessment and management;
- as a preliminary step, encourage other countries to adopt effective measures for the protection of human health and the environment;
- the establishment of international rules regarding the development and application of biotechnology should be encouraged.

The new communication, reference SEC(91) 1693, date 30 October 1991, is available in all Community languages, (see back page).

MICROELECTRONICS

JESSI To Spend ECU400 Million in 1992

92BR0192 Amsterdam COMPUTABLE in Dutch
10 Jan 92 p 3

[Article: "JESSI Participants To Spend 1 Billion Guilders in 1992"]

[Text] Munich—The companies and governments involved in JESSI (Joint European Submicron Silicon Initiative), the program with which Europe hopes to catch up with Japan in the field of microelectronics, appropriated more than ECU400 million (roughly 1 billion Dutch guilders) for the project in 1992. This was announced by the JESSI Board, the project's highest body, on the occasion of the assessment of the project's first two years of operations. This year will mark the beginning of the most important phase of the entire JESSI project, which is to continue through 1996 and during which more specific goals will be pursued. During the first two years, more than 300 project proposals were submitted to JESSI for assessment. About 70 of these were approved and carried out. The approved projects represented a total of 3,000 man-years of scientific and technical activities and involved more than 120 companies and research centers. The overall cost amounted to ECU460 million, half of which was financed by the participating companies and institutes. The national governments contributed 40 percent, while the European Community paid the remaining 10 percent.

Among the most important results achieved by JESSI in the first two years, the JESSI Board mentions the first 16-Mbit DRAM [dynamic random-access memory], the first 16 Mbit-EPROM [erasable programmable read-only memory], the development of technologies for chips with 0.7 micron linewidths, and the first version of a fully automated system for the design of microelectronic circuits.

Experience so far has moved the Board to redirect the project. Instead of focusing primarily on the development of design and manufacturing equipment for new chip generations, JESSI will shift toward more specific projects as of this year. More particularly, these projects include high-definition television, digital radio, broadband ISDN [integrated services digital network], cellular mobile phones, and automobile electronics.

Two Dutch organizations for scientific research, the STW (Technical Sciences Foundation) and FOM (Basic Research on Materials), have recently withdrawn from JESSI. Both organizations had been involved in JESSI from the very beginning. On behalf of the Dutch universities and other institutions, the STW and FOM coordinated the Dutch share in the BLR (Basic and Long-Term Research) program.

In March 1990, the STW submitted a request for financial support to the Dutch Government. After a long period of silence, it was revealed on Queen's Speech Day

[30 April] in 1991 that a sum of 8 million guilders would be appropriated to be spread over four years. According to STW spokesman Eggen, his organization considered that this amount was totally inadequate given the importance of the research and that Dutch participation in the project would lose all its credibility. Eggen added that not only the Dutch Government, but also the governments of other European countries were reluctant to contribute to the basic research part of JESSI.

IBM, Siemens Build 64-Mbit Memory Prototype

92BR0193 *Amsterdam COMPUTABLE in Dutch*
10 Jan 92 p 9

[Text] Amsterdam—IBM and Siemens claim to have reached a landmark in the development of memory chips. Shortly before the end of the year, both companies announced that they had produced what they called a "production prototype" of a 64-Mbit DRAM (dynamic random-access memory), i.e., a memory chip with a capacity of 64 million bits of information. Observers believe that this gives both companies an edge on Japanese companies such as Hitachi, Toshiba, and Fujitsu. These companies are also working on 64-Mbit DRAM chips and, although they have already come up with some laboratory samples, they have not yet been able to show a production prototype. However, it is pointed out that IBM's and Siemens' lead may be non-existent since it is not known exactly how the Japanese competitors are doing, since the development of DRAM chips occurs in utmost secrecy.

DRAM chips are considered essential for various types of computers and also for applications in consumer electronics. The DRAM used most frequently nowadays is a 4-Mbit type. Several companies, including IBM and Siemens, are also manufacturing 16-Mbit DRAM chips. It is expected that the first computers to be equipped with this type of chip will be marketed by mid-1992.

Spokesmen for IBM and Siemens emphasize that many technical problems still remain to be solved before the 64-Mbit DRAM chip can be produced, probably in 1995.

Inmos' Successes, Problems in Transputer Development

92WS0311A *Duesseldorf WIRTSCHAFTSWOCHE*
in German 24 Jan 92 p 72

[Unattributed Article: "Parallel Processors—Midgits with Team Spirit—Europe Enters Race Against Mighty U.S."]

[Text] Once before, the engineers of the British semiconductor manufacturer Inmos Ltd. from Bristol had caused a small sensation. Five years ago, they succeeded in presenting the giant U.S. competitors with a superfast microprocessor. At that time, the transputer chip from Bristol set a new speed record for parallel processors in its class.

However, records are transitory—especially in microelectronics where the performance of the top chips is doubling every two years on average. "By now, our competitors have clearly caught up," says Uwe Augspurger, marketing manager with SGS Thomson Microelectronics, Inmos' parent, referring to the stiff competition with American semiconductor giants Intel, Motorola and Texas Instruments. Today, these companies are controlling the market with markedly faster CPUs.

Inmos suffered another setback: As late as two years ago, it could claim to have the most widely sold Risc processor with 240,000 pieces sold. However, one year later, it was outdistanced by the so-called Sparc chip made by Sun Microsystems Inc., the U.S. manufacturer of workstations.

Such defeats spur on Inmos manager Ian Pearson's ambitions. Pearson, head of the company's Transputer Business Unit, is convinced that the successor to the processor types T400 and T800 which are currently being offered will be successful. The new T9000 system will contain approximately 2.3 million transistors on an area of only 190 square millimeters and will thus offer a performance ten times higher than that of the processors currently on the market. With its high cycle rate of 50 Megahertz, this Bristol chip can process up to 200 million commands per second (Mips). Peter Eckelmann who is in charge for Inmos marketing in Germany together with his SGS partner, is ecstatic: "Currently, the transputer is absolutely without competition in its suitability for building completely new multiprocessor systems." Inmos is currently the only European supplier on the profitable world market for microprocessors.

While the processors offered by large U.S. manufacturers are primarily used for processing information in personal computers and workstations, Inmos founder Ian Barron designed his Transaction Computer from the very start as a team worker rather than a stand-alone. Since successful team work requires good communication channels in addition to excellent individual performance, Barron provided his new creation with a very special function: By using fast communication channels—so-called links—he avoided bottlenecks in the exchange of data between the processor and its environment.

This shows the advantages of the Transputer architecture more clearly. The high-performance, Transputer-based computers developed by the small, but extremely active circle of European pioneers in parallel processing centered around Parsytec GmbH in Aachen and the British company Parsys Ltd. has now won the grudging respect even of the mighty U.S. computer companies.

By now, the superfast parallel processors have won acceptance for industrial use as well. They allow all operations in the automation process—measuring, controlling, communicating—to occur simultaneously (in parallel), not successively. Battenfeld Kunststoffmaschinen Ges.m.b.H., a manufacturer of injection molding machinery located in Kottlingbrunn in Lower Austria,

equipped the control units of its machines with the transputer core from Bristol. Even complex molds which previously had to be poured using a lot of time and manual labor can be manufactured without any problems today.

Manfred Helzle, head of the communications company Hema Elektronik Fertigungs-und Vertriebs-GmbH in Aalen, Wuerttemberg, would not want to do without the British parallel processor any more. "The Transputer makes the design of complex image processing systems and neural networks both easier and cheaper—and in many cases, these systems would not even be possible without it."

By now, the Inmos system has found acceptance even among the big shots of the international electronics circle. Researchers at Hewlett-Packard in California are currently working on a novel memory concept for super-performance workstations. The electronic logic is controlled by transputers. Today, the Japanese are also relying on the British chips from Bristol. Just recently, Fujitsu introduced a parallel computer with a European processor. The Inmos managers are particularly pleased about a large order from the U.S. No less a company than IBM intends to equip part of its memory controller which is sold by the millions with the Inmos system T400.

There are still problems with the extremely complicated manufacturing process for the T9000, a superchip, which Alcatel, the French telecommunications giant, has already included in its plans for the next generation of communication systems. Because of these problems, the introduction date had to be postponed twice. Chip experts estimate that the Inmos team are three years ahead of their U.S. competitors who are trying to imitate them; however, this lead is narrowing noticeably. Time is running out: "If we cannot deliver the T9000 in the third quarter of 1992 at the latest, the transputer will have had it," warns Augspurger of SGS Thomson trying to get his chip architects to hurry up.

German Institute Develops Three-Dimensional Chips

92WS0314A Duesseldorf WIRTSCHAFTSWOCHE
in German 24 Jan 92 p 70-71

[Article by Wolfgang Mueller: "3-D Chips: New Dimension—Researchers From Stuttgart Causing a Sensation With Three-Dimensional Circuits"]

[Excerpts] [passage omitted] Electronics experts are trying to arrange the individual components on the chip not only next to each other, but also on top of each other in order to avoid the electrons from jumping out of line. "The future belongs to the three-dimensional chips", says Ian Ross, president of AT&T's Bell Laboratories where researchers are already busily experimenting with 3-D prototypes.

However, these efforts have not yielded any tangible success as yet. German scientists at the Institute for Microelectronics (IMS) in Stuttgart-Vaihingen, on the other hand, can point to more substantial results. National and international journals praised the first truly functioning 3-D chip from Baden-Wuerttemberg as a "milestone in chip development." Bernd Hoefflinger, head of the institute, sees realistic market opportunities: "If a chip manufacturer would join in now, our process could be used industrially within two years."

If the team from Swabia should really be able to make the leap into the three-dimensional realm, they could produce memories (SRAMS) and logic chips which would require only half or even a quarter of the area used by conventional, two-dimensional chips. With this method, the transistors are packed on top of each other in three "floors." The silicon layers which differ in their electric characteristics are applied by vacuum evaporation in so-called epitaxy reactors. This complicated process ensures that all layers consist of perfect crystals.

The only competition the chip developers in Stuttgart might have to face comes from the Far East. The Japanese have been working on their 3-D chips since 1981, among them seven of Japan's financially strongest semiconductor manufacturers: NEC, Toshiba, Sanyo, Oki, Mitsubishi, Matsushita and Sharp. Each company sets its own priorities. Sharp, for instance, is developing a three-dimensional chip for character recognition, while Mitsubishi presented a prototype of a 3-D image processing circuit.

From the very beginning, the Japanese 3-D proponents concentrated on the so-called laser recrystallization process. To build up the various floors, amorphous silicon applied to the wafer is melted by a laser beam and subsequently crystallized. "The Japanese have been betting on the wrong horse," smiles IMS project leader Gerhard Roos from Stuttgart, "since the quality of the silicon produced with this method is considerably lower than the quality of our material."

Today, the team from Swabia has every reason to smile, since prior to their unexpected success all European 3-D researchers had been trying in vain to come up with acceptable results. The development activities of the European Esprit program were discontinued two years ago. Even the financially strong Siemens AG in Munich threw in the towel: In 1989, the company suspended its three-year 3-D program which was part of the JESSI project. They did this, even though the Siemens people had already completed the outer structure for two silicon floors: "The whole thing is much too expensive," was the conclusion by Siemens semiconductor researcher Josef Goetzlich. "We feel there is no economic basis for mass application."

Despite their successes, the microelectronic researchers of the IMS in Stuttgart are somewhat skeptical about the future. "While the Japanese are consistently sponsoring 3-D technology despite their technical problems, the

Europeans are again about to say goodbye to a promising technology," is IMS project leader Roos's criticism. And Hoefflinger, the institute head, is quite emphatic: "It would be a shame if we had to yield this field to the Japanese although we are currently ahead."

FRG: New Method to Produce GaAs Crystals

92WS0365A Zurich NEUE ZUERCHER ZEITUNG
(INTERNATIONAL EDITION) in German
12 Feb 92 p 37

["Crystal Growth on Magnetic Bearings"]

[Text] Today's ubiquitous silicon chips are sawed out of cylindrical, silicon monocrystals, about the thickness of an arm. Such crystals are grown according to the Czochralski process, wherein the liquid silicon is in a heated crucible. The crystal, which grows from one nucleus, is slowly removed from the melt while undergoing constant turning. In this way, monocrystals made of other semiconductor materials like gallium arsenide, for example, can be obtained.

To be sure, precisely that very rapidly changing gallium arsenide presents great difficulties. For one, the gallium-arsenic mixing ratio has to be maintained very carefully. Doing this presents problems because both components of the semiconductor vaporize out of the melt at different rates of speed. In addition, the growth of the GaAs crystal proceeds at a rate 10 times slower than that of silicon. Consequently, to grow bigger crystals, the optimum conditions for growth must be maintained for several days on end. The probability is very great that point defects will develop in unacceptable high concentrations.

The growth process of gallium arsenide crystals is also extremely vulnerable to disruptions. The faintest shaking or vibration of the crucible or the pulling apparatus can result in uneven crystal growth. Friction vibrations at the melt-crystal interface and vibration transmissions from the drive motor to the crucible are particularly unpleasant. The Juelich Research Center in Germany has developed interesting approaches to the solution of this problem. Among them is an air-tight, closed crystal pulling area and a vibration-free, mechanical system with noncontact magnetic bearings and drives. The ends of the crucible and crystal rotary systems form the rotor of an electric motor. The surrounding stators consist of permanent magnets and adjustable electric magnets, by means of which the axes are kept at the desired height and remain precisely centered.

The magnetic forces of these very unusual bearings are so strong that they can bridge a gap of about 25 mm. This space is occupied by a vacuum-tight housing that contains the drive axes. This is followed by an air gap that ensures the absolute contact-free nature of the system. The housing wall has to be heated to 650°C, otherwise the arsenic fumes coming from the melt would precipitate on it. Heating elements are required inside and cooling elements outside, especially in the bearing areas,

which must then be designed relatively thick. The problem of housing wall corrosion, caused by the extremely aggressive, hot arsenic vapors, has not yet been satisfactorily resolved. On the other hand, the diameter of the crystal can be programmed in a simple way. Since the weight of the crucible and the growing crystal are transmitted to the magnetic bearing, any variation in weight can be easily measured. It is a measure of the rate of growth. The appropriate control of the pulling rate makes it possible to maintain a prescribed, constant crystal diameter.

NUCLEAR R&D

Framatome, KWU To Build Next-Generation Reactor

92WS0341A Paris AFP SCIENCES in French
30 Jan 92 p 27

[Text] Bonn—Mr. Adolf Huttli, chairman of Germany's KWU, a Siemens Group's company, announced on 29 January in Bonn that France's Framatome Group, together with KWU, will develop a new generation of nuclear reactors, the design of which is to be completed jointly before the end of this year. Construction work on this new generation of reactors could begin in 1998, Mr. Huttli added.

The new-generation reactor is to be defined under the aegis of NPI (Nuclear Power International), a company owned jointly (50 percent each) by Siemens and Framatome, with the head office in Paris. NPI was founded in 1989. KWU spokesman Wolfgang Breyer stated that the power of this reactor of the future will be approximately 1,500 megawatts. He said that "the idea of small reactors was dismissed because it presents no commercial advantage."

Germany's nuclear program has been paralyzed since the end of the 1970's by strong opposition on the part of public opinion, premised on environmentalist arguments. Electrical power of nuclear origin constitutes only a third of the electricity produced in West Germany, versus three quarters in France.

Germany: Heavy Ion Research, Applications in Darmstadt

92WS0362A Stuttgart BILD DER WISSENSCHAFT
in German Feb 92 pp 24-27

[Article by Klaus-Dieter Linsmeier: "Atomic Boreholes: Heavy Ions Become High-Tech Tools"]

[Text] Physicists move up their big guns to study the atoms. By means of a new accelerator, heavy ions advance to become precision tools for industry.

One would have to search long and hard to find a similar close link between the purest of basic research and

everyday applications. The researchers are using enormous cannons to bombard atoms for heavy ions in order to find out just "what holds the world together in its innermost core," and in the very same experiment they are producing the finest structures for microelectronics or medical filters by means of which sickle cell anemia might be diagnosed.

For a short time now, the researchers at the GSI [Society for Heavy Ion Research] in Darmstadt have had another accelerator at their disposal by means of which they can impart a hundred times more energy to their atomic bombardments than before. "Now we can probe even deeper into the secrets of matter," Professor Paul Kienle, the research director at the GSI, explained, "and at the same time this machine has opened entirely new possibilities for the industrial use of heavy ions."

Ions are electrically charged atoms. Hydrogen, gold, uranium, and everyone of the more than 100 elements discovered to date can be ionized. In the normal state, the atoms of these substances are electrically neutral. The nucleus of the atom contains just as many positive charges (protons) as negative electrons orbit it.

Electrons are the bearers of all negative electrical charges in the world. The positively charged protons together with the uncharged neutrons make up the nucleus of an atom.

When the electrical balance of an atom is disturbed as, for example, when an electron is torn away, a charged atom—an ion—occurs. It is somewhat in that way that atoms are exposed to bombardment with free electrons. They collide with the loosely bound electrons of the outer atomic shell and knock them out of their bonding.

An electrical voltage brings charged particles into motion. In an accelerator's vacuum they race toward their target at thousands of kilometers per second, bundled and guided by magnetic fields. When they impact the object targeted, called simply the target, their energy of motion is released. In the collision, atomic nuclei are excited, split, or fused with the impacting particle.

The greater the ion mass and charge, the more motion energy it can absorb. Such fast ions can penetrate very deep into their targets. With an energy of 200 GeV (gigaelectron volts), for example, they may penetrate to a depth of up to 30 centimeters. Moreover, heavy ions have very little lateral scatter, which is to say, that when penetrating solid bodies, they are not diverted. At the end of their travel, they impart their high energy almost like a hammer blow.

To date, this energy has been achieved in a 120-meter-long linear accelerator—GSI's UNILAC [Universal Linear Accelerator] in Darmstadt. The accelerating gap in UNILAC consists of 300 drilled-through metal cylinders, bedded in vacuum tanks. Each one carries a voltage of 500 kilovolts, resulting in a total of 150 million volts, which impart to the particles an energy of 20 million electron volts per nuclear constituent. With

this amount of energy, the particles have about 20 percent of the velocity of light.

Now a new cyclic accelerator recently went into operation in Darmstadt. This heavy ion synchrotron (SIS) has a 70-meter diameter and increases the energy of the orbiting ions a hundred-fold. The UNILAC serves as a preaccelerating gap for the SIS.

The fast ions are not just a toy for the researchers; they are also a tool of "fine mechanics." They mill edges and bore holes in microscopic scale. The engineers call for "the smaller, the better" in their quest for ever finer "boring and chiseling." Such dimensions have existed in nuclear research for a long time. Physicists dissect the atomic nucleus with heavy ion beams. Now commercial producers are also working with these tiniest of tools—heavy ions to be used as bombs.

An accelerated uranium ion leaves its traces behind in solid bodies. Electrons are torn out of their trajectories, positive atomic cores suddenly stand opposed to each other, and repel each other. This movement around the injection channel spreads out like a shock wave. The higher the energy of the ion was, the deeper the channel becomes; the more charges it had, the wider the channel is, which is to say, that more electrons have been torn away from it.

Uranium ions, which have only half of their 92 electrons, gain enough energy to drive a 0.01-micrometer-wide damage zone 200-micrometers deep into the material. To do this, an accelerating voltage of at least 100 million volts are required. At the present time there are only five places in the world that have accelerators this powerful: Berkeley (USA), Dubna (USSR), Caen (France), Riken (Japan), and in the GSI in Darmstadt, whose accelerator is ranked the top accelerator in the world.

In the production of electronic circuits, structures far smaller than a micrometer have to be etched with great precision. In the case of a 64-megabyte chip, for example, some elements are only 0.25 of a micrometer in size. Light is much too gross for the imaging of such fine structures, and even Roentgen projection techniques almost reach their limits here. However, the electron beam writing technique is very suitable for this. To be sure, many electrons have to be focused on one point in order to achieve sufficiently strong damage. On the other hand, a single heavy ion can do the job. Ion beams can be generated, focused, and controlled as well as electron beams. The GSI is already working on a writing beam that can place a very few and even a single ion in a precise spot.

The writing beam can be used to produce tiny 0.1-micrometer structures, which is of the greatest importance for the further development of microelectronics. Because the finer the individual elements of a highly integrated circuit are, the greater is the packing density and the smaller are the switching times because of the shorter conductors.

But ion beams are not just being sought for the production of microelectronics circuits. Their singular ability to bore fine holes makes them useful for making filters as well. When the bombarded material is thin enough, through channels are formed.

A filter for air analysis, an arrangement out of thin quartz glass panes, has already been experimented with. When several such, with increasingly small pores, are arranged one behind the other, aerosols—suspended particles in the air—can be sorted out by size. The aerosols form a thin deposit on the quartz glass that alters the vibration behavior of the glass. Thus, the concentration of aerosols of a particular size can be observed directly on the “tone figures.”

Filters with precisely defined pore sizes play a decisive role in modern medical research. In that field, filters with but a few holes are interesting, and even filters with just one hole. In the latter case, the measurement instruments simulate fine capillaries having a diameter of only about five micrometers.

Red blood corpuscles have to manage these narrow passages on their way through the body. To accomplish this, nature has endowed them with great flexibility. A stiffening of the erythrocytes either accompanies or causes some life-threatening diseases as, for example, sickle cell anemia.

A one-hole-filter is well suited to test the plasticity of the erythrocytes. Stiff blood corpuscles require a longer time to bore through the vessels, or else they clog up completely. The condition can be measured as elevated electrical resistance.

Nine patients with sickle cell anemia were examined with a French-made device, fitted with the new GSI-produced filters, in one of the first clinical studies. The researchers reported a significant difference in the average corpuscle passage time as compared with a healthy control group.

It is only possible to manufacture one-hole-filters by playing a sophisticated trick. Normally, several billion particles fly in an ion beam per second. In order to thin out this dense beam under controlled conditions until just a single ion remains for a one-hole-filter, the investigators have to be more clever than the ion. The beam's intensity is reduced and defocused until the remaining intensity is distributed over a sufficiently large area and only a few holes per surface area occur. Now the procedure becomes a matter of just tenths of a second. The beam has to be cut off right after the first hole has formed, but before the second one.

In regards to its efficiency, the one-hole-filter is an exotically rare product of an ion beam—something like capturing a single drop of water after the fire hydrant has been turned on. One very important application for the ion beam is an aerial bombardment in optics.

In this case the ion beam serves as a micro-sized rasp. After a dense ion bombardment and subsequent etching, the surface of the optical material looks like a crater landscape. It appears this way only under the microscope however, since the dimensions at their largest are measured in terms of light wavelengths. If the craters are smaller than a tenth of a wavelength however, they can no longer “see” the light. They then form an uneven pattern, whose structure can no longer be broken down in the visible part of electromagnetic radiation. Disturbing diffraction and reflection are absent.

If the depths of the craters are deeper than one light wavelength, then that surface structure forms an overlapping area between air and glass in which the optical density increases constantly from the air to the glass. The final effect of this is that reflections, as they occur in the transition from light to optical interfaces, are avoided. The coating on eye glasses and lenses serves the same purpose. Ion bombardment can replace those conventional coatings. The advantage is that while coatings are always slightly tinted, the view through lumenized glass subjected to ion bombardment remains untinted.

Unfortunately, the average consumer will probably never have the pleasure of wearing these improved glasses, since the surface of these special glasses is very vulnerable to cratering and fouling. They therefore remain reserved as optical surfaces that are used only in closed systems.

Ion bombardment basically damages the surface of glass, even when the particle traces only penetrate a few thousandths of a millimeter. Sometimes, however, deeper-reaching damage can be quite desirable as, for example, in the case of electrical insulators used in space, where they are subjected to greater requirements and have to be reliable.

High voltages are discharged between electrical connections in the form of sparks. The metal used in the wires can attenuate in this case. Should the metallic fumes condense on an insulator in a thin, but electrically conducting layer, the insulator is shorted out. This can be a serious problem in space, since short circuits cannot be repaired in space. On the other hand, any additional built-in safety feature adds to the transport weight.

Intensive bombardment with greatly accelerated heavy ions can help. Given an ion density of 108 particles per square centimeter and an acceleration voltage of about 100 million volts, a maze of steep cliffs and gorges forms on the surface of the insulator after etching. The individual walls have a thickness of about a micrometer and are up to 50 micrometers high. The metallic fumes have no opportunity to build electrical bridges, since parts of the old surface repeatedly penetrate the conducting layer, like the peaks of a mountain chain breaking through the clouds. In an experiment involving gold vapor, an insulator that had been bombarded demonstrated a 10 billion times more resistance than an untreated insulator.

Just how swiftly heavy ion beams become a commonplace tool in industrial practice is strictly a matter of cost. A facility for lower energy radiation, such as has been employed for a long time in surface area treatment, costs about 1 million German marks. That, however, represents just the simplest type of use. For the projects described in this report, the cost for equipment may rise 30-40 times as high. This is simply to say that a large accelerator, such as the one in the GSI in Darmstadt, would have to be used.

For that reason, the scientists in Darmstadt have generously put their facility and their experience at the disposal of industry. Radiation time on the various accelerators totalling a maximum of 50 days a year is available to industrial users.

International research on the use of heavy ions is currently concerned with particle trace generation and the modification of material properties—again projects involving a close linkage between basic research and problems in applications.

GSI currently has a project—important in both manned and unmanned space ventures—in which the effects of cosmic radiation, which largely consists of high-energy ions, on electronic circuits is being experimentally investigated.

SUPERCONDUCTIVITY

Germany: Research in Superconductor Applications

92WS0311A Duesseldorf WIRTSCHAFTSWOCHE
in German 24 Jan 92 p 66-68

[Article by Andreas Beutner: "Superconductors: Computers Are Racing Ahead—Cool Types—To Increase Performance Microprocessors With Novel Conductors to be Put on Ice"]

[Text] When it comes to forecasting the future development of semiconductor technology, Eckhardt Hoenig, in charge of high temperature superconductors at Siemens AG in Erlangen, is rather cautious. Exaggerations are not Hoenig's style. He has learned from experience that all too often, high expectations had to be toned down. Still, Hoenig, who is a professor of experimental physics, is certain that in the coming years the most important application for superconducting materials "will quite clearly be microelectronics."

Johannes Georg Bednorz and Karl Alexander Mueller, who received the Nobel prize in 1987, discovered new, ceramics-based materials which conduct at temperatures far higher than the absolute zero point (-273°C) and the temperatures required by classical superconductors. At present, electronics has to make do with 20 million cycles per second. In the future, it can use switching frequencies in the picosecond range using high temperature superconductors. That means that information is processed at least 500,000 times faster than in conventional networked computer systems.

Based on the puzzling property of superconductors to conduct current without resistance at relatively high temperatures above -196°C, researchers and industry expect huge sales. According to cautious estimates by the Federal Ministry for Research and Technology (BMFT) the market potential is in the "two digit billion range."

American and Japanese companies are trying particularly hard to get the superchips to the production stage. U.S. companies such as IBM and AT&T are working with the Massachusetts Institute of Technology (MIT). In Japan, the influential Japanese Ministry of International Trade and Industry (MITI) is sponsoring the electronics industry with the goal to use high-temperature superconductivity (HTSC) for hyperfast supercomputers.

However, German researchers are skeptical. "A lot of unfounded hopes were raised when it comes to superconductivity," says physicist Meinhard Schilling, HTSC project leader at the University of Hamburg's Institute for Applied Physics. To explore the possibilities of ceramic superconductors for medical diagnostics, the Institute for Applied Physics is working with the medical technology division of the Philips research laboratory in Hamburg. The Hanseatic R&D coalition was able to show respectable results even after a short start-up period. Using microstructure technologies they were able to develop magnetic field sensors from the new superconductors.

Such squids (superconducting quantum interference devices) are able to detect minute magnetic fields caused by electrical pulses in nerve conductors and to combine them into a readable computer image. This process requires highly complicated technology, since the signals which have to be detected are one billion times weaker than the earth's magnetic field.

Previously used squids consisted of classical superconductors which have to be cooled to -269°C using expensive liquid helium. By now, the Hamburg laboratory has produced the first prototypes of ultrasensitive transducers which use the ceramic material yttrium-barium-copper oxide as a basis. Recently, the Hamburg researchers were able to etch structures with widths of less than one thousandth millimeter into a ceramic superconductor using an argon-ion beam. "We are now in a position to customize superconducting thin layers for various applications," Schilling says proudly. Thus, squid chips can be used primarily in the noncontact testing of materials and for precision measurements.

The high-frequency engineers are also among the pacesetters when it comes to the development of combination chips. The Daimler-Benz research institute in Frankfurt, for instance, is working on antennas with low attenuation. "The application field is enormous," beams Roland Fischer, leading thin-film expert, "such systems send extremely low-noise signals and can even detect iron ore deposits far below the earth's surface." Siemens has already gone one step further. They have prototypes of superconducting high-frequency chips. Plans are to send

a miniaturized antenna into space for testing. There, the temperatures in the shade are sufficiently low to cool the antenna to the level where it becomes superconducting.

German industry researchers expect the biggest successes from the integration of superconducting composites and conventional silicon-based chips. The Daimler research center in Frankfurt is currently testing a superconducting receiver chip made of gallium arsenide which cycles at a frequency of 35 gigahertz. An exciting world-wide technology race has started for the so-called Josephson junctions which are considered to be the core of future computer chips.

Chip architects have been working on the super sandwich chip since 1973. Until a few years ago, they had been trying to build the Josephson elements from classical, metallic superconductors. They have been using the new ceramic materials for a short time only. The response times of such Josephson elements are in the range of a few picoseconds (a trillion of a second). However, technology experts do not expect usable Josephson junctions until 1995.

Even medium-sized companies such as antenna manufacturer Fuba Hans Kolbe & Co. are not afraid of joining the superconductivity adventure. And the pioneer spirit is paying off. In a relatively short time, the Fuba team which works under the company name of Forschungsgesellschaft fuer Informationstechnik mbH (FIT) in Bad Salzdetfurth was able to present a usable so-called high temperature superconducting microstripline resonator which reaches frequencies of 1.4 gigahertz when cooled with nitrogen.

This has been a start. In addition, the team from Lower Saxony sees great opportunities in the field of magnetic and electrical precision measurements. It took the team under FIT managing director Professor John Hinken only one year to develop a proprietary manufacturing method in order to bring magnetic field sensors (squids) to the mass production stage. "This was the entry into the market," the university professor sums up their efforts with satisfaction. The first squids have already been sold. However, by far not everything went smoothly. Computer programs for the computer-aided design of superconducting high frequency and microwave modules were not commercially available. Therefore, the computer scientists of the Hinken team had to piece together their own software.

However, besides funding from the Federal Ministry for Research and Technology, such achievements do not get much more than polite applause at the moment. "In contrast to several company giants, we have entered the market already," Hinken remarks pointedly.

TELECOMMUNICATIONS

German Telecommunications Minister on Privatization Strategy

92BR0172 Paris ENTERPRISES & TELECOMMUNICATIONS in French Jan 92 pp 88-91

[Interview with German Telecommunications Minister Christian Schwarz-Schilling, by Herve Marchal: "Forty-Nine Percent of Telekom Must Be Privatized"]

[Text] German Minister for Post and Telecommunications Christian Schwarz-Schilling, the man who has guided German telecommunications through change for nearly 10 years now, has announced the next stage in his reform. This will be the privatization to the tune of 49 percent of Telekom. He must, however, secure the agreement of the opposition in the Bundestag: This kind of development requires a modification of German Constitutional Law. In any case, he wants to act speedily. His deadline is 1992. However, he is in favor of maintaining the monopoly on telephones and the basic network in the long term. He agrees that Europe should adopt a pragmatic industrial policy. And he remains optimistic on the Community's prospects in terms of world competition.

ENTREPRISES & TELECOMMUNICATIONS

[E&T]: You have promoted and directed German telecommunications policy for nearly 10 years now. In this respect, you have launched a major reform in which you have played the key role. How far has this reform progressed today? Are you going to continue, even reinforce it?

Schwarz-Schilling: The greatest reform possible was carried out at the time. When I set up and completed this reform, it was impossible to go any further. It was then and remains now the most important reform of the century. Since then, however, a number of new elements have emerged and provide us with the opportunity of taking a step further. They are the development of world markets and, even more rapid, of the European market and the special efforts to equip our five new Laender. The latter has had significant financial consequences.

We should therefore move ahead but we will have to find the necessary political consensus with the opposition, because this progress requires a modification of constitutional law. This means achieving a two-thirds majority in the Bundestag, our Parliament. At the time of the reform, about two and a half years ago, this kind of consensus was impossible. Today, considering the developments I have just mentioned, it is possible to achieve.

E&T: Do you therefore think that you will be able to successfully accomplish this new stage in your reform?

Schwarz-Schilling: No, I did not say that. I indicated what I would like. Because I do not know if, right now, consensus can be reached with the parliamentary groups I need. I suppose that in two or three months we may be

able to judge if the necessary majority required to change the constitution can be reached.

E&T: What would the terms of this development be? Would it be a total deregulation comparable to that in force in Great Britain?

Schwarz-Schilling: For certain points, yes; for others, no. The status of the company would have to be changed. The best thing would be for it to adopt the status of a corporation so that Telekom could have real freedom to operate at world level. This is not at all possible now because of the present state-controlled structure of the company. According to our constitutional law, the German Government is not allowed to operate in Japan, the United States, or in any other country; we can only act through subsidiaries. But that is not a good solution. Parallel to that, we have no intention of relinquishing the majority in this new company under private law. The state as a majority shareholder is a good thing.

E&T: Does Telekom have to be privatized to be able to operate abroad?

Schwarz-Schilling: Yes. It is absolutely necessary because if it keeps its status as a state institution it cannot effectively act as an operator in foreign markets.

E&T: But what kind of status would the national operator Telekom then have?

Schwarz-Schilling: The status of a corporation.

E&T: Would this status be comparable to that of France Telecom?

Schwarz-Schilling: France Telecom is a public company, it is not an ordinary corporation. As an institution, I believe that it has public missions to assume. But I think that this status will no longer be necessary in future.

E&T: Will Telekom be a company with private capital?

Schwarz-Schilling: One could imagine that private capital will reach 49 percent, and this would settle many financial problems. I believe indeed that the government will get a good deal when Telekom is quoted on the stock exchange. But certain legal aspects will have to be changed. The financial compensation of telecommunications to the postal service will no longer be able to take place, because this provision is not in keeping with those concerning corporations. Until such time as the postal services balance their budgets—in or around 1996—the financial compensations provided by Telekom will have to be maintained.

E&T: How long will this reform take?

Schwarz-Schilling: The decision should be made during this present term of office, in 1992. Otherwise, "he who arrives too late is punished for life," as Gorbachev would say. The respective market shares of the major international operators will be decided on in the next few years. If we lose time in useless debate, if we are told, "we will

think about it, we will introduce this reform during the next term of office," it will already be 1997-1998 and by then I believe it will be too late; especially in Europe. Operators in eight EC countries already have the status of a corporation (Italy, Spain, Great Britain, the Netherlands, Denmark...). Only France and Germany, the two most important countries, have not yet taken this step.

E&T: And you want to take it...?

Schwarz-Schilling: Yes. If the political conditions are right, I will do it.

E&T: That means that France could find itself very isolated with its nonprivatized operator.

Schwarz-Schilling: Such a danger could indeed exist; however, I think that in France there is also some debate about the privatization of state-owned companies. Take the case of Bull, for instance, where foreign capital was even brought in. Thus, the question should be raised whether our companies should not first and foremost be organized for private law status, so that capital does not come from just any source. This would allow the company to be quoted on the stock market under the best conditions, or to give associates shares. This would, in my opinion, be a much more satisfactory solution. I think that the French Socialist Party no longer rejects this kind of thinking as it did 10 years ago.

E&T: Do you envisage British Telecom-style privatization with a large number of shares being held by the general public?

Schwarz-Schilling: My preference would be for a wide distribution of shares, a popular shareholding. Like we did with Volkswagen, for instance. Parallel to this, we should be careful that a limited number of shares are issued, to avoid the formation of oligopolies. This could happen if other telecommunications companies started to purchase large packets of shares.

E&T: Why do you think that privatization should not go beyond 49 percent?

Schwarz-Schilling: Telekom is at the moment carrying out several public-interest missions: extension of networks, provision of the same services in rural and urban areas at the same inexpensive rate. Some politicians would like it to maintain its monopoly on the network and telephone service. This is why state control over 51 percent of the shares is logical. For this reason I would commit myself to seeing that Telekom maintains its monopoly over the telephone and the network.

E&T: Could the work that is currently being done in the eastern part of Germany to upgrade the network—Telekom is not working on this project alone—not be considered as a test case for future competition?

Schwarz-Schilling: Not at all. The conditions are absolutely identical. There is the same degree of competitiveness and the same monopoly. But there will be a transitional period offering the possibility to private companies of providing telephone services by satellite to establish links between the eastern and western parts of Germany. I allowed this because, in many cases, Telekom could not provide telephone services quick enough. And I did not want firms which were likely to invest in the eastern part not to do so because no telecommunications network existed. But as soon as Telekom is able to provide normal operational services, in other words in one or two years time, it will be more cost effective for companies to communicate via the public telephone network. The only difference is that the eastern part will have the most modern telecommunications system in Germany within three to four years.

E&T: What do you think of the latest European directive on the attribution of government contracts? Does this mean that there will be a real opening from now on?

Schwarz-Schilling: That we must operate in a much more liberal way is clear. At the European level, differences between a national company and a European company should no longer exist. In Germany, we are quite advanced in this respect, but many companies do not take advantage of the situation or are not capable of meeting the required specifications. For this reason it is necessary to achieve joint standards rapidly. Otherwise we can issue as many directives as we like but nothing will work. But there are also political barriers. I would like France to liberalize its market in this sector, because it is quite difficult for German companies to become public sector suppliers.

E&T: Is the problem of standards of top priority today?

Schwarz-Schilling: In certain sectors, standardization is an absolute prerequisite. However, at the same time, for reasons of efficiency, we cannot choose more than two or three switching systems per country. Therefore, in this area, we will need 10, even 20, years for specifications to be harmonized because the life span of these systems is 10, 20, or 30 years. But the situation is different in other sectors. For terminals, for instance, or for the provision of services, it is possible for French firms to work in Germany and vice versa. We are heading toward open networks, which can be used by any services supplier. Consequently, there is no need to undertake major standardization work. I am saying this because, very often, the question of standardization is an excuse not to open up markets, but to be protectionist instead.

E&T: Specifically, are you interpreting the Open Network Provision (ONP) in the British way—i.e. cut-throat competition—or in the French way—i.e. harmonization of the major European public networks?

Schwarz-Schilling: We tend more toward the British interpretation in this sector. However, I would not speak in terms of cut-throat competition but free competition.

On the question of value-added services and data communications services, we have a situation of totally free competition in Germany, whereas in France there is partial regulation with respect to approval and authorization. As for data switching, we have full competition; in France, there are specifications with very special conditions which do not exist in Germany and which we do not consider to be necessary. In the area of telex services, France still has the monopoly, whereas here we have free competition. For leased lines, we no longer have restrictions, whereas in France, if my memory is correct, there is still one which is in effect until 31 December 1992, regarding the resale to third parties. Thus, in this sector Germany takes a more liberal stance which tends more toward the British interpretation. However, it is only a matter of a couple of years, or even months, before France adopts this attitude because it is the general trend.

E&T: Is the position you have just expressed about France not too diplomatic?

Schwarz-Schilling: Why should you think that?

E&T: There is the feeling that the gap is very wide between your general orientation and that of the French.

Schwarz-Schilling: The differences were even greater three years ago. In the meantime, France has also experienced reform. As for the EC directives, we are in agreement on many sectors. For others, however, negotiations are intense. All in all, you know, harmony between the two countries has not waned. On the contrary, it has increased a great deal. Therefore it was not a diplomatic reply. In fact France will adapt because this is the general trend in Europe, Asia, and the United States. There is no question of preserving an island of protectionism in an ocean of liberalization. And I have noticed that the new [French telecommunications] minister, Jean-Marie Rausch, has taken this view.

E&T: What are the main areas in which you have problems with France?

Schwarz-Schilling: It does not seem right, for example, that the French Government has so much control on the question of German companies buying stakes in French firms. I would have liked to see that at the time when Alcatel took over SEL [Lorenz Standard Electric] in Germany—which we accepted without any restrictions—Siemens or other companies would have been able to take similar initiatives in France. This could have been the case with the CGCT [General Company for Telephone Engineering] which was finally taken over by the Swedish firm Ericsson, solely because of government intervention.

E&T: One of the most important questions for Europe today is the following: Should the EC equip itself with an industrial policy in a field as sensitive as electronics, for example?

Schwarz-Schilling: It is absolutely essential that we join forces. But the question is how? The Japanese found a very efficient formula by "voluntarily" joining their forces at the national level. There is no question of this in Germany because we are against any kind of government planning. Indeed, I think that the best solution is a compromise between the two. There are sectors in which results can be achieved only if significant resources are mobilized. That is why I think that we can only be successful if we look beyond national borders and build on European strengths. I am very pleased with such programs as EUREKA [European Research Coordination Agency] and RACE [Research and Development in Advanced Communications Technologies in Europe], in which we are endeavoring, on a voluntary basis, no one is obliged, to coordinate our objectives for the whole European continent. So I am fully in favor of coordination and pooling resources. Otherwise, we will not survive in the world battle which is raging between other major industrial powers in the United States, Japan, and East Asia. However, we should not drift towards political regulation. We should always remain pragmatic.

You see, I am more on the French side than the British. In England, complete industrial sectors are disappearing. This is not the future I would hope to see for Europe. But agreement must be reached on funding research and development programs. And in this respect, we have completely different models. Direct subsidies do not exist in Germany.

E&T: Let us take JESSI [Joint European Submicron Silicon Initiative]. Do you think we can achieve collaboration between the three main chip manufacturers, i.e., Siemens (which has nonetheless come to an agreement with IBM), Philips, and SGS Thomson?

Schwarz-Schilling: To accomplish such an important project, we need above all to define the European objectives. I do not think it would be a good idea to reinvent the wheel when it exists somewhere else as a finished industrial product. In fact, since financial problems are widespread, we should set our priorities. Would it not be better to restrict ourselves to very limited objectives which would enable us to be competitive in relation to American and Japanese manufacturers and to avoid sectors of the market where excellent products already exist? All that we need to do is to opt for a very realistic approach leaving questions of prestige to one side.

E&T: The area of high-definition television (HDTV) embraces both the aspect of state prestige and the strictly economic aspect: The survival and development of two major European manufacturers, Philips and Thomson, are at stake. What are your thoughts on this issue?

Schwarz-Schilling: I fully endorse the adoption of D2-MAC and HD-MAC as European standards for satellite-transmitted HDTV. Unfortunately, we were unlucky. Because our first satellite was not operational, we were delayed by two years. I fully agree with the French,

whom I have always supported on this issue, although in Germany there is a huge controversy with broadcasters on the subject.

This is why the European HDTV directive has to be adapted to the realities as they exist. We cannot say "from 1992 onward, there will only be D2-MAC for satellite transmissions," when in Germany we have 3 million satellite aeriels which operate in PAL or SECAM. Therefore we need the so-called "simulcast," which offers the possibility of working with the two standards and progressively passing to the new one.

I am fully aware of the importance of leisure electronics for the European microelectronics sector. It would be most unfortunate if such an important sector were to no longer exist to provide us with European-made electronic chips and components.

E&T: The D2-MAC seems to have a real market from now into the next century, but is the analog HD-MAC not destined to fail considering the imminent arrival—if what American manufacturers are saying is true—of digital HDTV?

Schwarz-Schilling: No, I do not agree. If we want to hold on to all of this sector, it is important that we start building up markets now. It is like mobile radio communications. If we had made the decision not to have an analog standard while waiting for the digital GSM ([Special Mobile Group] standard), we would not have mobile communications in Germany today. Cars would not be adapted to it; there would be no customer service; and the client himself would not be aware of the advantages of the mobile telephone. This is why it was important to start with the analog standard. And, on the basis of this experience, we are now able to introduce digital technology much more easily. The same goes for HDTV. We absolutely cannot burn our bridges. We must take it one step at a time.

France, for example, set out on the wrong track at the beginning of the 80s by banking on fiber optics to launch cable TV. I had to fight a hard battle in Germany. I was told at the time that France and Great Britain were using fiber optics. So I carried out all the necessary studies and I noted that this technology was not at all cost effective for home cabling. We chose copper and now 10 million homes have cable. This would never have been possible had we started with fiber optic cabling.

But today, all our inter-city connections for the telephone network are done with fiber optics. The only segment in copper is the connection from the roadside, where the fiber passes, to the home. And by the time full fiber optics is available for all homes, 15 million homes will already be connected.

The story is much the same with the Caravelle in aeronautics. The leap from the Caravelle to Concorde was too great. It would have been better to take an

intermediary step and to build aircraft like the Boeing for instance. Fortunately, we produced the Airbus and made up for lost time.

We are in the very same situation with the digitization of television. It will be years before the United States introduces the digital technology. This is why I think that we must take a small step forward first and not one that takes us into the next millennium.

E&T: The coordination committee for the multilateral control of exports, Cocom, which was set up during the Cold War to protect western technology from falling into the hands of Communist countries, forbids the laying down of a Transsiberian fiber optic cable linking the Baltic to Kamchatka. Considering recent political developments in the East, do you think this is realistic?

Schwarz-Schilling: We have always been committed to establishing this link. I do not think that this stance makes sense any more. Dictatorships are even more nervous when modern mass communication techniques exist because they cannot control how they are used. In my opinion, this will not last. But for the security of our own links with the East, we should also have transmission.

E&T: You are generally described as a very committed European. Tell us how you think European telecommunications can keep its good position in the world market today against Japan and the United States?

Schwarz-Schilling: Competition is always a good way of keeping strong. But it cannot be a one-way process. It must be fair. Also because of the increasing automation in the high-technology industries, labor costs have less impact. Europe therefore has an opportunity to occupy a leading position thanks to its know-how. One difficulty of a social nature may persist, regarding the reduction of working time, securing more holidays and social benefits. If this aspect, and this one alone, explains Japanese or American superiority, then we are wrong. However, if we pay close attention to this internal problem and we obtain, from the exterior, equitable conditions of competition, Europe will then find its place. It will have nothing to worry about.

EC Council Adopts D2-MAC Directive

92MI0192 Bonn *DIE WELT* in German
23 Dec 91 p 12

[Text] "A breakthrough"—or, alternatively, "a corpse overdue for burial": such are the differing reactions to the decision over the future of European high-definition television (HDTV). The EC's Council of Ministers has passed a directive that adheres to the D2-MAC European interim standard, enabling consumers to make a gradual transition to cinema-quality television. The main supporter of the D2-MAC standard is the European entertainment electronics industry, fearful for its own domestic market, as its Japanese competitors are going ahead with their own HDTV standard.

Media policymakers in the German cabinet criticize the EC's decision as protectionism and, as such, against the interests of consumers, even if the Brussels plans have been considerably toned down. CDU [Christian Democratic Union] deputy Joseph-Theodor Blank feels it is economic nonsense to require satellite operators and program makers to invest heavily in a technology providing only slight improvement in picture and sound quality, and which will soon be obsolete, with the result that consumers who equip their sets specifically for D2-MAC will then have to purchase new equipment to receive HDTV transmissions in HDTV quality. Before the EC's decision, Hans-Joachim Otto of the FDP [Free Democratic Party] called for the success or failure of D2-MAC to be decided in the marketplace.

[Federal Telecommunications Minister] Schwarz-Schilling counters that all concerned now had sufficient guarantees to plan ahead, and equipment manufacturers had the opportunity to gain a lead over their competitors. The D2-MAC TV standard and the wide screen format enabled viewers to enjoy higher quality now, he said, rather than waiting until the year 2000; this was the only standard that made it possible to transmit TV programs in 16:9 format. Pal Plus, the development from the Pal system favored by TV companies, would only be available from the mid-90s.

The EC directive requires all new satellite programs to be transmitted in D2-MAC from 1995; until the very last moment, the EC commission also intended to require programs existing before then in conventional standards to be transmitted in D2-MAC as well. Schwarz-Schilling stresses that, as this requirement for existing services to be transmitted in D2-MAC has now been removed, "there is no requirement for consumers to buy new equipment."

Brussels had previously made a concession in another area. Originally, a D2-MAC decoder was to be compulsory for all TV sets with a screen diagonal measuring over 52 centimeters that came onto the market after 1993. Consumer groups were not alone in regarding this as an unjustified infringement of the consumers' right to freedom of choice, and the requirement is now to be restricted to 16:9 TV sets, though other sets must be fitted with a socket for a D2-MAC decoder.

At German insistence, the directive lays down no rules on subsidies. Brussels was in favor of an introductory incentive, primarily to assist program makers, to the tune of 2 billion German marks over five years. The coalition meeting hosted by the Federal Chancellor instructed Schwarz-Schilling not to agree to this in any circumstance. The issue is not yet settled, however, and EC commissioner Filippo Maria Pandolfi is due to present new proposals by the end of April.

Germany: Siemens Develops Optical Push-Pull Receiver

92MI0204 Stuttgart LASER UND
OPTOELEKTRONIK in German Dec 91 p 13

[Text] Siemens' central research laboratories have built an optical push-pull receiver as part of the RACE [Research and Development in Advanced Communications Technologies in Europe] program. The core of the receiver is a chip containing two monolithically integrated photodiodes connected in series. The photodiodes convert the optical input signal, superimposed on the signal from the local oscillator by way of a directional coupler, into an electrical intermediate frequency. A three-stage high impedance design was chosen for the further stages of the push-pull receiver. Low-noise preamplification of the electrical signal from the photodiodes takes place in the first stage; the second stage uses an equalizer circuit to produce a flat frequency response. The third stage has been optimized at 50 Ohm for the best possible output matching. In the laboratory this receiver module achieved a sensitivity of -59 dBm for a 140 MBit/s heterodyne system in FSK (frequency shift keying) mode; this world record is only 2.4 dB above the theoretical limit.

France: Telecommunications Official Discusses Europe's Need for Cable, HDTV

92WS0216C Paris LE MONDE in French
11 Dec 91 p 20

[Interview with Andre Rousselet, president of the Canal-Plus channel, by Michel Colonna d'Istria; place and date not given: "Canal-Plus President: 'Europe Needs a Dual Satellite Television System'"—first paragraph is LE MONDE introduction]

[Excerpt] He holds a key position in French radio and television—and, since recently, one of the most beautiful offices in Paris, at the brand new Canal-Plus headquarters overlooking the Seine. In the interview he gave us, Mr. Andre Rousselet, president of the coded channel, approved the European approach of transition to high-definition television, explained his strategy concerning cable and satellite television, and outlined his vision of the future of the Havas group, whose president he used to be and whose eminence he remains.

[LE MONDE] What do you think of the European guideline on satellite television currently under discussion.

[Rousselet] I note with pleasure that, in Brussels still more so than in Paris, decision-makers bow to the obvious and cohesion eventually prevails... The Commission's latest text goes in the right direction, that of the realistic proposals which, together with others, we had recommended to the Commission and in particular to Messrs Pandolfi and Dondelinger.

[LE MONDE] But is it not a failure to postpone to 1995 the obligation to broadcast according to the new MAC [Multiplexed Analog Component] standards?

[Rousselet] Not at all! At Canal Plus, we believe in D2-MAC, a standard that will make possible the advent of European high-definition television which, in turn, will unquestionably make a difference. We are also convinced that, in years to come, the new 16/9 large screen format will "pull" the D2-MAC systems, certainly not the contrary. Because although D2-MAC is promising, how could today's average consumer be fully aware of it? We must therefore offer him a "plus" that is immediately tangible, and it is the 16/9 format that will sell tomorrow's TV sets today. To the manufacturers who think that D2-MAC is an end in itself, I say: first believe in your products if you want to succeed in selling them! Rely more on the qualities of these products than on regulatory constraints, and implement a daring policy of "promotion" prices to impose them on the market.

[LE MONDE] But then, why not offer the 16/9 right away, and why did you change your position recently, when you suggested that Telecom 2 should broadcast its future bouquet of theme channels in SECAM [Sequential Color and Memory] format?

[Rousselet] Neither large-screen TV sets (1,000 or less of which have been sold in France to date!) nor copyrights on films made in 16/9 format are readily available. By 1995, we shall have to step up our efforts to promote broadcasting and production in 16/9 format. It is for this, among other things, that the financial means of the EEC should be used. We shall probably have to set up a fund to aid production in D2-MAC 16/9 format, and manufacturers would be well advised to imitate their Japanese counterparts and contribute to such a fund. And that would be only fair. Aren't they the ones, and the only ones, who will benefit from the new standards?

To impose the D2-MAC 16/9 broadcasting format as soon as possible, and before this standard imposes itself on the public in 1995, we shall have to launch new satellites and make the necessary channels available free of charge to volunteer broadcasters, who will in turn pay part of the programming costs. This will probably be the essential financial decision made in Brussels, to complement its guideline. Thus, it will be possible to launch pre-Europesat in 1994, then Europesat in 1996, to provide continuity with TDF1/TDF2, Marco Polo, or Olympus, these showcases of the new standards, which are still too delicate for broadcasters to ensure their promotion today.

Thus, as early as 1995, at least four channels—Canal Plus, Cine-Cinemas, Cine-Cinefil, and also the German coded channel Premiere—will broadcast a majority of programs in 16/9 to over 350,000 subscribers, or even more. By then, these 16/9 channels, and many others, if subsidies give them easier access to satellites, will have raised the public's expectations to such an extent that the obligation imposed by Brussels upon other channels, to

convert to simultaneous broadcasting according to the old and the new standards will look like the obvious thing to do. It will then no longer be necessary to force the consumer; he will spontaneously demand a screen complying with the new standards.

Simultaneously, a second series of satellites will acquaint consumers with reception through individual or collective parabolic dishes, and will enable the new channels to get into their strides without excessive additional technical cost.

For Telecom 2, the problems encountered with TDF1 and with cable TV have convinced us that increasing the risks by imposing the "rump" D2-MAC standard (i.e. in the 4/3 format) would amount to willfully complicating what is already an audacious wager. Let's launch for the benefit of the majority these theme channels that only a few hundreds of thousands of French people are now receiving via cable, and only then let's offer the convenience of the new standards. [passage omitted]

DASA Official Criticizes Germany's Plan to Cut Telecommunications Satellite Funding

92WS0234A Duesseldorf VDI NACHRICHTEN in German 15 Nov 91 p 34

[Interview with Dr. Manfred Hollstein, head of German Aerospace product range, satellites, and use systems, by Wolfgang Mock: "Development Prospects for Communications Satellites; Search for Ever Higher Output"; date and place not given—first paragraph is VDI NACHRICHTEN introduction]

[Text] VDI-N, Duesseldorf, 15 Nov 91—The federal government is at present planning to make further cuts in its appropriations for telecommunications. "A big mistake," is how Manfred Hollstein sees it. He reproaches the federal government for being "unique in Europe" in its behavior.

[VDI-N] In the United States they are at present talking about whether the future lies in big geostationary satellites or small ones that circle in lower orbits.

[Hollstein] If we want to build them at a reasonable price, we have to put as many transponders as possible on a satellite. Only in this way can the price per kilogram of satellite sent into orbit be lowered. This is why the tendency to build big geostationary satellites will certainly continue.

[VDI-N] But these satellites have their drawbacks too.

[Hollstein] The time it takes for light to reach us from great distances is an acute problem. In order for these satellites to have a reasonable reception-field strength on earth, they need higher output. Most receiving antennas are no longer suitable—apart from some exceptions—for private use because of their size. The big satellites are better suited to feeding signals into a terrestrial network.

[VDI-N] So the small satellites are needed more for the new services, like mobile radios?

[Hollstein] That's not without its problems either. Those satellites in a lower orbit of 300 to 400 km aren't stationary over a fixed point. So a relatively large number of satellites is needed to achieve even coverage of specific regions.

[VDI-N] How do you think things look?

[Hollstein] Right now the iridium project with 77 satellites and the global star system with 48 are being discussed. Because of the short distances involved, even when several satellites are being used for an overseas transmission—perhaps when telephoning—one would not have the delays that one has with the big geostationary satellites.

[VDI-N] So these signals could then be received with a small portable handphome?

[Hollstein] Yes, in which case the global star system uses the available telephone systems. There has to be a station in every country which makes contact with a nearby satellite, the signals from which are then fed into the network. The iridium system is a so-called overlay system. With it an additional telephone network for communications via these iridium satellites is set up.

[VDI-N] Along with these, does the future lie with the small communications satellites?

[Hollstein] I don't think so. After all, viewed from a worldwide standpoint, only one, tops two, such mobile-radio systems make any sense. Among the geostationary satellites there are those that operate in the worldwide association, like Intelsat and Inmarsat. In addition to them, there are a lot of regional satellites, and they will in future provide a large part of the market with services.

[VDI-N] Satellite radio is still exclusively electromagnetic. Are new technologies being planned here?

[Hollstein] Naturally, the advantage of optical transmission is the greater bandwidth; many more television programs or telephone channels can be accommodated. But the disadvantage is that it is blocked by clouds. It's no medium for transmissions from space to earth or vice versa. But optical transmission is really the most logical medium for communications between individual satellites.

[VDI-N] Two systems on one satellite are necessary for this type of transmission.

[Hollstein] The problem can indeed be solved. But to do so, those huge antennas that also have to be moved all over the place are no longer needed. A light beam could be much more easily deflected. The satellites are all indeed in motion toward or against one another.

[VDI-N] So what important technical developments may we yet anticipate with communications satellites?

[Hollstein] Above all, those that increasingly shift switching technology—the switching network—to the satellites. This switching capacity is today still largely located on earth. But without this kind of electronics, a system like the iridium system is also unthinkable. In addition to this, we are increasingly trying to shift the transmission frequencies to higher frequencies, up to a range of 10 to 14 GHz.

[VDI-N] Don't satellites have to be even more flexible?

[Hollstein] It is today still difficult for a communications satellite to electronically line a transmitted beam up with a specific target. The latest development is moving in the direction of this kind of active antennas. And if an antenna independently lines itself up precisely with a target, considerably less output power is required since the beam is more compact. A more widespread trend is moving in the direction of replacing the broadband thermionic tubes used in satellites with semiconductors. High-performance semiconductors in the K_U bandwidth constitute a focal point of development in connection with this.

[VDI-N] Must we be prepared for a drop in satellite prices similar to those of semiconductors?

[Hollstein] Prices will be determined by the number of satellite manufacturers. There are still too many of them in Europe and we'll close ranks and possibly further reduce our production capacity. American companies like Hughes or GE Astro have a backlog of orders of up to 70 satellites while we're happy if we're building two or three. This makes it considerably harder for us to come up with competitive prices.

[VDI-N] Furthermore, other countries can count on generous public-sector orders in connection with the development of satellite technology.

[Hollstein] The federal government is making a big mistake with this. We're in a position to build good satellites, but we have the price problem. Now, after TV-Sat and the DFS *[German Television]* Kopernikus, the federal government says: "You certainly know how to build them; now establish yourselves on the world market." And the Federal Post Office does nothing for research. In behaving this way, we're unique in Europe.

[VDI-N] Doesn't Telekom's [Telecommunications Office] new market-economy philosophy represent a danger to German satellite manufacturers?

[Hollstein] We must indeed adjust to the fact that Telekom buys only on the basis of economic criteria. And if it can get a satellite in the United States for DM10 million less [than here], it will certainly buy it there. Whether this will enable us to survive we'll see in three or four years from now.

DESY Research Foundation Acquires East German Physics Institute

92WS0234B Duesseldorf VDI NACHRICHTEN
in German 15 Nov 91 p 30

[Article: "New Government Contract Signed in Zeuthen on Monday; Institute for High Energy Physics Becomes Part of DESY Foundation"]

[Text] VDI-N, Zeuthen, 15 Nov 91—The research associates of the German Electron Synchrotron (DESY) in Hamburg are getting 131 new colleagues. On 1 January 1992 the Institute for High Energy Physics (IfH) in Zeuthen, Brandenburg, will become part of the DESY Foundation. BMFT [Federal Ministry for Technology] chief Heinz Riesenhuber, Brandenburg State Minister for Science, Research, and Culture Hinrich Enderlein, and Hamburg Senator for Science and Research Leonhard Hajen signed the necessary new contract for this on Monday of this week. The next annual budget of about DM20 million will be funded in accordance with the customary ratio for major research appropriations: 90 percent from the federal government and 10 percent from Brandenburg State.

In reaching this decision, the politicians followed a recommendation of the Science Council, which in January had already attested to the IfH's "high quality of scientific research as measured by international standards."

In addition to improving education and instruction, close contacts between DESY in Zeuthen and the nearby universities in Potsdam and Berlin are planned. In view of the lack of efficient particle-accelerator facilities, the only institute for experimental high energy physics in the new federal states was already using the DESY accelerator in Hamburg in the days of the GDR. Following joint research projects between 1962 and 1969 which had to be discontinued due to political pressure, close contacts have been maintained between both institutions since 1983 in cooperation with the IfH on the design and improvement of the H-1 Hera detector.

Moreover, IfH scientists are participating in a European Institute for Particle Physics (CERN [European Nuclear Research Center]) experiment to investigate high energy electron-positron reactions as well as in Soviet projects in Dubna and Serpukhov. Another focal point for the scientists in Zeuthen is neutrino research. It is therefore only logical for them to also be cooperating with Soviet physicists on the Baikal experiment. They are thinking of building a giant detector system that would be installed 1,000 meters under the surface of Lake Baikal in Siberia to detect neutrinos in cosmic radiation.

France Telecom's New Cellular Phone Being Tested

92WS0235C Paris AFP SCIENCES in French
5 Dec 91 p 19

[Text] Strasbourg—On 2 December in Strasbourg, some 2,000 people began testing Bi-Bop, France Telecom's

new cordless pocket telephone system which makes it possible to place national and international calls from the street.

Each of the lucky 2,000 who will receive the tiny telephone set—it weighs 200 g and is the size of a pocket calculator—has been asked to come in for his or her own personalized demonstration. France Telecom hopes to use this six-month test to fine-tune its new product before launching it in Paris in April 1992. While this is a pilot program, participation is not free. Even so, applications streamed in, and it was necessary to reject one out of two.

To allow communication, 270 public terminals were installed in local shops in order to create a network in the town center. In compensation for the presence of a terminal in their shop, merchants have a choice between a lump sum of 1,000 francs a year or a Bi-Bop cordless telephone and free service.

Use of the Bi-Bop will not be limited to just the street. It will also be possible to use it at home or at the office, in which case the set will link to a private terminal or a business telephone exchange.

France: Group Formed to Promote HDTV

92WS0236B Paris AFP SCIENCES in French
5 Dec 91 p 22

[Article: "Creation of Working Group to Promote HDTV in France"]

[Text] Paris—Several French ministers and other notables involved in European HDTV [high-definition television] decided on 28 November to create a working group to consider ways to promote the 16/9 "cinematic" television screen format.

The meeting was attended by Ministers Elisabeth Guigou (European Affairs), Jean-Marie Rausch (PTE [Posts, Telecommunications and Space]) and Georges Kiejman (Communication), as well as the CEO's of Canal Plus and Thomson Consumer Electronics, Messrs. Andre Rousselet and Bernard Isautier.

Participants agreed on the need to promote 16/9, since this wider-screen television format is better adapted for the viewing of motion pictures and sports events. The 16/9 format should also promote the new D2-MAC [intermediate] standard, which is a stepping-stone toward European HDTV.

At the same time, a new version of the draft European directive on HDTV reportedly has been drawn up in Brussels; several countries have been trying to kill the previous version for months. The new draft, which according to some sources "may be fairly close to the French position," apparently has been adopted by the European commissioners and should be presented at the next meeting of EEC posts and telecommunications ministers before Christmas.

Scandinavia Begins D2-MAC Broadcasting

92WS0245D Paris LE MONDE in French
14 Dec 91 p 19

[Unattributed article: "The Filmnet Pay-TV Network Will Broadcast in D2 MAC"]

[Text] The Filmnet pay television network, covering The Netherlands and Scandinavia, will start D2-MAC broadcasting as of 15 December, using an Astra satellite channel. The film network signed a contract with France-Telecom for the management of the pay channel according to the Eurocrypt standard, and it ordered 100,000 receivers from Philips. Filmnet, which will continue to broadcast in PAL on another channel, will then be able to shift progressively to the 16/9 large-screen broadcasting format. Thanks to this double (simulcast) broadcasting, Filmnet is anticipating for its commercial needs the European guidelines that will soon be adopted and would make such "simulcast" broadcasting compulsory by 1995 (LE MONDE, 3 December). The conversion of Filmnet confirms the breakthrough of D2-MAC on the Scandinavian market, where over 150,000 decoders are in use.

German Mobile Satellite Communications Ground Station Developed

92MI0253 Bonn WISSENSCHAFT WIRTSCHAFT
POLITIK in German 22 Jan 92 p 6

[Text] A highly mobile earth station for communicating with the TUBSAT satellite launched six months ago has been developed and successfully put into operation by the Berlin Technological University's Aerospace Institute. The battery-powered station, which has a transmitting power of five watts, weighs only 750 grams, and can easily be carried in a purse, pocket, or backpack. Data filling a DIN A4 sheet can be entered and accessed by means of a standard electronic notebook keyboard. Twice a day (at midday and in the evening, depending on local time), TUBSAT passes over the earth station, collecting or supplying new information, so reports and replies can be exchanged anywhere in the world within 24 hours.

Though the earth station has only just been completed, keen interest has already been expressed by arctic and antarctic researchers, international aid organizations and yacht owners. It also has educational applications, and can benefit both university and high school students.

Italy: Improved HDTV Codec System Described

92MI0257 Milan L'ELETTRONICA in Italian
Jan 92 pp 79-80

[Article by Giovanni Ricca: "Evolution of the HDTV Codec"]

[Excerpt] [Passage omitted] The managing director of Alcatel Telettra, Domenico Ferraro, later detailed the recent improvements to the HDTV codec.

Firstly, the new codec is capable of functioning at a bit rate of between 45 and 145 Mbits per second. This opens up new possibilities for transmission of the HDTV signal through a single fiber optic channel at a U.S. Standard of 45 Mbit per second, or at the new Sonet Standard of 51 Mbit per second, or a narrowband satellite communication channel (27 or 36 MHz), with notable savings, both in the cost of satellite time, and in the construction of ground stations. This result was obtained by combining the DCT (discrete cosine transform) hybrid, already used in the version presented last year, with a compensation for movement, which allows for transmission of only the moving parts of scenes, thereby reducing the quantity of information to be handled. The extremely high calculation capacity necessary to achieve this compensation has been obtained by integrating 130,000 logical ports at high velocity.

The second improvement is the increased horizontal definition which has been improved from the 1,440 pixel per line version used during Italia 90 to the 1,920 pixel per line version introduced at Telecom 91.

Alcatel Telettra's new HDTV codec has now passed the theoretical/experimental stage and production will begin in late 1992 at Telettra's plants in Vimercate (Italy) and Torrejon (Spain).

Even if the production volume will not be very large initially, this new product could prove to be of interest not only to broadcasting companies, but also to other organizations.

High definition can be successfully used in many applications where conventional television transmission is not effective. For example:

- simultaneous distribution of films (the reel of film is substituted by a high definition magnetic tape from which the stored information is then read and transmitted to any number of cinemas simultaneously from a central point);
- television teaching (for example the transmission of film, for educational purposes, of surgical operations with images of many minute details that must be clearly seen);
- data transmission for CAD (computer-aided design)/CAM (computer-aided manufacturing);
- remote monitoring of those industrial processes that cannot be carried out in the presence of humans and need to be filmed, seen, and controlled in high definition.

The forecasts of the high definition market are subject to numerous variables, initially, the market will probably develop quite slowly. The first applications to be developed will be professional, while a widespread domestic usage will require a consistent increase in the rate of replacement of television sets, currently calculated at around one billion sets worldwide.

Finally, as for radio broadcasting, Alcatel Telettra's HDTV codec is not affected by the standardization

problems currently being debated in Europe, since it is compatible with all broadcasting systems currently in use.

Telettra, which was founded in 1946 and became part of the Alcatel group in 1991, is a world leader in its field, supplying systems to over 80 countries. Alcatel currently has nine operations in Italy, and employs some 6,300 people (about 45 percent of whom hold degrees or diplomas). Alcatel also holds shares in six industrial corporations.

Within the Alcatel group, the company is active in the fields of radio communications, space and defense, and network systems, producing a vast range of solutions and of cable transmission equipment. Furthermore its activities encompass all the stages necessary for the realization of turnkey plants, from network design and engineering to the production of the equipment, its installation and maintenance, and personnel training.

German Telecommunications Firm To Enter Eastern European Market

*92WS0262A Duesseldorf VDI NACHRICHTEN
in German 27 Dec 91 p 8*

[Conversation of Dr. Michael Schwarzer, managing director of ANT, with Martin Buchenau, Caspar Busse, Petra Meffert, and Bettina Weberling: "East German Telephone Mess Stimulates Business; Romantes Project for Satellite Communication in the USSR Planned"; first two paragraphs are VDI NACHRICHTEN introduction]

[Text] Backnang, 27 Dec (VDI-N)—Competitive pressure causes profit margin in communications technology to shrink.

The liberalization of the telecommunications market is now forcing even the Swabian high-tech company ANT to change its ways of thinking. Increasing competition is affecting profits. ANT managing director Dr. Michael Schwarzer revealed some strategies for the future in a conversation with trainees from the Georg von Holtzbrinck School.

"We are well equipped for the future and need not fear international competition." With these words, ANT managing director Michael Schwarzer outlined the situation of his company. ANT-Nachrichtentechnik GmbH (annual sales of 1.4 billion German marks [DM]) in Backnang handles Bosch Telecom's public communications sector. Along with private and mobile communications technology, Bosch Telecom had sales of DM7.2 billion in 1991. Thus, the Swabians rank, worldwide, as number eight behind telecommunications giants such as the French Alcatel (DM26.8 billion) and the U.S. company AT&T (DM26.2 billion).

Schwarzer is even happier about recent growth: For 1991, he anticipated a 10 percent jump in sales. However, the profit situation cannot keep pace with that. The reasons for this are drops in prices of as much as 7

percent in the highly competitive telecom market. Cost cutting measures such as shorter development and production times can only partially compensate for the drop in profits, concedes Schwarzer. The reason for the increase in sales is the strong demand from the new German Laender. The German Bundespost Telekom will have to invest approximately DM55 million in the ailing telephone network of the former GDR during the next six years. In awarding the contracts, the ministers in Bonn noted that ANT is building production facilities and creating jobs in the new German Laender. "In the first three years, we will invest DM60 million in the new German Laender," Schwarzer described the movement. ANT has bought the microwave radio and information technology sectors from the former Robotron company in Redeberg near Dresden.

Within the framework of turn-key programs, ANT is installing ready-to-use communications systems for the Bundespost. By the end of 1997, the new German Laender will have the most modern telecommunications network in Germany. Therefore, the ANT managing director already has his eye on the growth markets in Eastern Europe. Preliminary negotiations are already underway for the Romantes satellite-supported communications network in the former Soviet Union. ANT hopes to be able to deliver satellites, ground stations, and ground communications technology valued at more than DM100 million. "However, the main problem is the financing of the planned project," Schwarzer realistically admits. "Romantes should be covered by private capital and not by state credits."

Worldwide, ANT is looking for additional partners. So far, the Swabians are not active in the Far East; communications technology is being installed only in Thailand. Schwarzer cites his motto: "The cobbler must stick to his last." According to him, Bosch-Telecom is not a global player and must therefore define priorities for its activities. "With our location in Western Germany we have not been competitive over the long term," admits Schwarzer. "It is not easy to conduct international business in this island. Cooperative arrangements are however quite desirable and necessary to compensate for the lack of size." Therefore, partners who cover other regions or technologies would be considered. ANT is already cooperating with its competitors: With Siemens in switching technology, with SEL/Alcatel in radio, and with Philips in mobile radio technology. "We are, however, not a takeover candidate," warns Schwarzer. The legal form of ANT's parent company Bosch GmbH—a private foundation—rules out a hostile takeover.

Schwarzer feels well equipped for the European Single Market in the areas of technology and marketing. "Cooperation with competent partners in various sectors broadens our access to the market." For the planned digital mobile radio network (D-Net), ANT is delivering communications technology based on new EG standards both to the Bundespost Telekom and to the private network supplier Mannesmann. Domestically, ANT has

orders from the two services in the amount of DM200 million, plus another DM100 million abroad.

Schwarzer did not wish to label himself a friend of the old postal monopoly. To date 80 percent of ANT's sales have been under government contracts. However, "Bosch and ANT have made the most of the monopoly situation." Such a situation would in fact hinder progress, nevertheless "these purveyors to the court have made sure that Western Germany has the most modern telecommunications network in Europe."

Compared to U.S. standards, however, Europe lags in the implementation of what is technically feasible. In America, with Centrex, an intelligent telephone switching system which can do more than simply switch a call from point A to point B is available to every private customer. It is possible for every user to place incoming calls in a queue, to establish conference calls, or to forward calls to his current location.

This system is technically possible in Europe with the private automatic branch exchange (PABX). "An interesting situation, which I would welcome," says Schwarzer. In the same breath, the ANT head points out that the introduction of a comparable service in Germany is not favored by his colleagues at Telenorma, who are responsible in the Bosch group for private communications (branch exchanges for large clients). Whether anything comparable to Centrex will be available to the approximately 27 million private households anytime soon depends on the will of the German Bundespost.

Council Reaches Agreement on HDTV Standard D2-MAC

*92WS0269C Brussels EUROPE in English
16-17 Dec 91 pp 7-8*

[Article: "(EU) EC/Telecommunications: Council Reaches Agreement on HDTV, Adding Flexibility to the Draft Directive Aimed at Introducing the D2-MAC and HD-MAC Standards"]

[Text] Brussels, 19 Dec 91 (AGENCE EUROPE)—After a night and morning of negotiations, the President of the Telecommunications Council, Dutch Minister Mrs. Hanja Maij-Weggen, accompanied by French Minister Mr. Jean-Marie Rausch, German Minister Mr. Christian Schwartz-Schilling, Commission Vice-President Pandolfi and Commissioner Dondelinger, welcomed the agreement which will make the D2-MAC [Multiplied Analogue Components] standard compulsory for satellite broadcasts and will enable the introduction of the HD [High Definition]-MAC standard for high-definition television. "In the meantime, we have called on the Commission to pursue a dialogue with industry in order to finalize the financial implications of this directive," she added.

Vice-President Pandolfi commented that "in spite of the problems and a natural plurality of interests among member states, a great deal of the work on this file has

been completed." With regard to its financial aspects the Commission will conduct a study on the necessary measures. In addition, it will prepare a report every two years enabling decision-making for the duration of the directive.

French Minister Mr. Rausch described the agreement as a "great victory for Europe," with all the delegations clearly supporting the D2-MAC standard. German Minister Mr. Schwartz-Schilling said the Council had just given a clear signal and that "Europe has marked an important milestone," since it was time for clarity to reign among all the partners involved (industry, TV channels, etc.) which had given in to irritation over a long failure.

Commissioner Dondelinger said that: "Eight days after Maastricht, this agreement stresses Community competence in the field of culture."

The main provisions of the directive as modified unanimously by the Council provide for member states taking all the measures facilitating and promoting the introduction and development of advanced television services broadcast by satellite and using the HD-MAC standard for broadcasting partially digital high definition television and the D2-MAC for other partially digital broadcasting in 16/9 format. In particular, it is intended that: a) the HD-MAC standard alone can be used for all broadcasting of partially digital HDTV; b) the D2-MAC alone can be used for the broadcasting of all programmes in 16/9 format; c) the D-MAC standard has to be used for services launched from 1 January 1995. Services can also be broadcast simultaneously in PAL [Phase Alternation Line], SECAM [Sequence Electronique Couleur avec Memoire] and D2-MAC.

Compared to the Commission's modified proposal, the obligation, after the 1 January 1995, for services existing before this date, to be broadcast in D2-MAC alongside PAL, SECAM and D-MAC too, is eliminated. For services coming onto the market after 1 January 1995, the obligation to broadcast in D2-MAC will only take effect after the adoption by the Council of a decision aimed at giving them the support of financial assistance. The Commission will have to submit a proposal with figures next year. The directive, which will come into force six months after its notification, will be applicable until 31 December 1998 (instead of 31 December 1999, as the Commission suggested).

Vice-President Pandolfi said that the memorandum of understanding (signed between the economic operators) could soon be approved. He said that Community financing would only benefit the new services.

Swedish Telecom Wins Baltic Networks Contracts
92WS0269K Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 2 Dec 91 p 3

[Article: "Televerket Mopping Up Baltic Networks"]

[Text] Swedish Telecom (Televerket) is once again poised to enter a joint venture agreement with a member of the Baltic states. The agreement with the Latvian government will establish a company which will upgrade the entire Latvian telephone network. A similar agreement was recently reached with Estonia (*see ITI Issue 313*).

Under the Letter of Intent, covering a cooperation agreement with Latvia, the new company, to be called Lattelekom, is expected to be formed by the beginning of 1992.

The Latvian Government will be the majority shareholder of the new company, while Televerket's subsidiary, Swedish Telecom International will own the remaining, minority post. For the first two years of the agreement, Televerket will be responsible for the investment in new hardware.

Much of the technical know-how and development work will be carried out using Swedish resources, and the new company will have close ties to the Swedish telecommunications region of Kalmar which will provide staff for the venture. However, the main body of its employees will come from Latvia.

Televerket's subsidiary, Swedtel, will carry out the operative work on the venture.

Over the next two years, the intention is to install 75,000 new telephone lines in Latvia and 40,000 lines in Estonia.

Other short-term projects include installation of the basic structures for international gateways and an optical fibre network, as well as a radio link to connect the Latvian capital of Riga to the international network.

According to Swedish Telecom, the project will require an investment of over SKr1 billion over the next two years.

Swedish Telecom International is also part of a joint-venture company recently established to install and operate a nation-wide NMT cellular mobile telephone system in Latvia (*see ITI Issue 313*).

Total Televerket investments in Latvia through to 1995 is put at between SKr2 billion and SKr3 billion.

Over the past year, Televerket has signed four major contracts with Latvia and Estonia. In Estonia, a Memorandum of Understanding was signed in February this year to upgrade Estonian telecom infrastructure (*see ITI Issue 283*). This was followed in April by an agreement to establish a cellular joint venture company with the Ministry of Posts and Telecommunications of Estonia (*see ITI Issue 289*).

Philips Presents Commonwealth Projects

92WS0269L Chichester *INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE*
in English 9 Dec 91 p 4

[Article: "Philips Outlines Soviet Activities"]

[Text] Philips' German subsidiary recently attended the Energy Communication and Automation '91 trade fair in Moscow where it demonstrated equipment it is currently using in projects in the Soviet Union.

In cooperation with the Central Research Institute for Telecommunications in Moscow (ZNIIS), Philips is developing the long-haul communication system LS34S/OF. This transmission system for balanced copper and fibre optic cable enables digital signals of the third hierarchy level to be transmitted in accordance with CCITT [International Telegraph and Telephone Consultative Committee] recommendations. The new system is a further development of the PCM480S system which has been supplied by Philips manufacturing plant in Bautzen to the Soviet Union where it is being installed to modernise and extend transmission links in the long-haul networks.

Philips also demonstrated TSS, the telecommunications switching system for the transmission of voice, data, text and pictures. Designed and manufactured by Philips, the modular switching system is a flexible concept for narrowband and broadband applications. The central elements of the system are the ISDN [Integrated Services Digital Network], H1 and H4 switches which enable non-blocking switching of the narrowband and broadband channels.

This design means that the system can be used in a broad field of applications ranging from concentrators with 128 ISDN subscribers, to the local exchange with more than 28,000 ISDN subscriber circuits, up to the trunk exchange with over 5,000 trunk circuits.

For the project in Mozhaïsk, situated approximately 150 km west of Moscow, the standard switching system model is being used. ISDN technology is still subject to Cocom export restrictions.

EC Approves IMPACT 2 Program

92WS0269N Chichester *INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE*
in English 9 Dec 91 p 1

[Article: "Europe: EC Approves IMPACT 2"]

[Text] A four-year programme (1991-95) aimed at improving the supply and use of information services within the single European market recently received approval from the Commission of the European Communities (CEC) in Luxembourg. The programme, called IMPACT 2, will be formally adopted at a forthcoming Council meeting.

With a budget of ECU64 million, IMPACT 2 constitutes the main phase of the IMPACT (Information Market Policy Actions) initiative, the introductory phase of which was implemented in 1989-1990.

The overall strategic objective of this programme is to establish an internal market for electronic information services and to improve the competitiveness of European firms by promoting the use of advanced information services.

With a predicted 20 percent average annual growth rate for on-line services and new electronic/optical information products such as CD-ROM [Compact Disc Read-Only Memory], the year 2000 is expected to see a global market of ECU100,000 million for the worldwide electronic information services industry.

IMPACT 2 will concentrate on four action lines in which attention will be given to the requirements of small and medium-sized enterprises and less favoured regions. The areas are: Improving the understanding of the market; overcoming legal and administrative barriers; increasing the user-friendliness of services and improving information literacy; and support for strategic information initiatives.

Swiss Mobile Phone Contract Awarded

92WS0269O Chichester *INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE*
in English 2 Dec 91 p 4

[Article: "Switzerland: Ericsson and Ascom Win GSM Contract"]

[Text] The Swiss PTT ([Post, Telegraph, and Telecommunications] administration) has chosen Ericsson and its local partner Ascom to install the new national digital mobile telephone system, NATEL D GSM [Group Special Mobile], with Ericsson being selected as sole supplier of all equipment for the system through to 1995.

The order, valued at SKr500 million, is for the delivery of six AXE switches, 205 digital radio base stations and network planning. Installation will be carried out between 1992 and 1995. When installed, the system will serve 200,000 subscribers and cover all the major Swiss cities and highways.

Earlier this year, Ericsson supplied the Swiss PTT with a GSM pilot system which was displayed in Geneva during the Telecom '91 exposition in October.

This is the second time the PTT has contracted Ericsson to create a national mobile telephone network. In 1987, Ericsson and Ascom installed the major portion of the Swiss analogue NMT900 network. To date, Ericsson has delivered eight AXE switches and a large number of radio base stations for the Swiss NATEL C analogue network.

The NMT900 network currently has more than 170,000 subscribers and is adding between 4,000 and 5,000 new subscribers every month.

Ericsson recently strengthened its relationship with Ascom when they created a joint venture company to concentrate on development of SDH [Synchronous Digital Hierarchy] equipment. Contrary to reports then, Ericsson is not planning a similar joint venture with Fuba. It already has one (*see ITI Issue 299*).

British Researchers Develop Optical Amplifier

92WS0227A Duesseldorf VDI NACHRICHTEN
in German 13 Dec 91 p 22

[Article by Richard Sietmann: "Optical Amplification for 40 Million Television Households; Cable Hookup Costs Could Be Considerably Lowered"; first paragraph is VDI NACHRICHTEN introduction]

[Text] VDI-N, Duesseldorf, 13 Dec 91—Only passive optical amplifiers provide access to the full transmission power of fiberglass. However, these expensive high-tech components are still only installed in the television network in sporadic fashion. British Telecom engineers have now developed a technique, through laboratory experiments, which may soon make it possible to reach an entire city of a million with passive television distribution.

With fiberglass there is, for the first time, a means of transmission of practically unlimited bandwidth which exceeds the terrestrial wavelength spectrum by several orders of magnitude available to communications technology. This is why the idea of bringing fiberglass right into each subscriber's home was discussed from the point of view of sheer unlimited transmission capacity and potential expansion of the supply of communication services.

Compared with the more than 30,000-GHz bandwidth of monomode fiberglass, the 47-450-MHz spectrum of today's BK [expansion not provided] network for cable television based on copper coaxial cables looks really skimpy. Innovations like the conversion to digital transmission or the introduction of high density television (HDTV) could only be realized with the available network, if at all, with a considerable reduction in the usual number of channels.

Copper cables create another disadvantage. Because of the high degree of attenuation caused by transmission and signal-splitting, they require an intermediate amplifier placed every 300 m on the average in the local distribution network to boost signals. This is why BK networks have been active networks up to now. Also, until recently optical transmission with fiberglass as a technical alternative did not seem to produce any real improvement. The amplifying power of semiconductor lasers in transmitters has up to now been enough to connect 200 subscribers in passive optical distribution networks without intermediate amplification. Thanks also to receiver sensitivity augmented by heterodyne

detectors, only slightly larger numbers of connections with about 1,000 subscribers were obtained sporadically in laboratory experiments—by, for example, the Heinrich Hertz Institute in Berlin or in connection with the RACE [Research and Development Program in Advanced Communications for Europe] 1010 Project.

But engineers of the British Telecom Research Laboratory (BTRL) in Martlesham, northeast of London, have now impressively demonstrated that the architects of the system can now completely rid themselves of these severe marginal limitations. They worked out an experimental system in the laboratory that can provide close to 40 million television subscribers with 384 digital video channels at a data rate of 26.4 Gbit/s per connection from a distribution center. This extreme signal-splitting rate was possible through the introduction of only two optical fiber amplifiers. The two-stage laboratory system was essentially produced with so-called 1x7 fiber-fusion couplers and in this way, to begin with, it simulated a splitting of the transmitted signal into 4,116 signals after passing through the first amplifier in the main feed point. Connected to this was a 25-km-long transmission section to the "local BK-network distribution point," where a second optical amplifier split the signal into another 9,604 signals. The operational radius of a system like this meets the needs of even a large metropolis as concerns range and number of connections.

By way of comparison: The local networks of the DBP [Federal German Postal Service] Telecommunications Division do indeed provide service over a square area each side of which is 8.5 km long. As a rule, this maximum range completely covers the area encompassed by a local telephone exchange. But this BK network is active in nature with numerous amplifier points on the way to the subscriber and it has a tree structure. The BTRL system, on the other hand, was based on a star structure and is completely passive from the local BK distribution point on. The advantage of the star topology lies above all in the fact that it is compatible with the structure of the telephone network. With it, program transfers and telephone services can later be handled in one network.

Alan Hill and Richard Wyatt of the BTRL achieved the high data-transmission rate per subscriber of their system by means of a wavelength multiplex with a total of 12 wavelengths in the optical wavelength range of from 1530 to 1554.5 nm. The data-transmission rate of these wavelength channels came to 2.2 Gbit/s—high enough to provide every single one of them in turn with 32 70-Mbit/s video channels in the time multiplex.

These really fantastically encouraging results were obtained through the introduction of fiber amplifiers impregnated with erbium, apart from the necessary peripheral equipment, externally these do not look any different than ordinary fiberglass. The amplification

effect is created by impregnating the fiber core with laser-active erbium, one of the elements in the rare earth periodic-table series.

The energy required for this is supplied through stimulation of the erbium atoms with the light from a continuously operating pump laser. In the process, erbium electrons are raised from their basic state to a higher state of energy which they at first remain in until the thus-accumulated energy is again released by the signal wave that rushes past them. This is the stimulated emission laser effect: As the wave moves through the erbium-impregnated fiber, its intensity increases at an exponential rate. The amplification is not only in phase with the signal wave, but is also so rapid that it can follow the digital pulse modulation into the 100-GHz range.

While other impregnation materials for other wavelengths are still being experimented with—for example, neodym and holmium at 1.3 μm —the erbium-impregnated fiber amplifiers that operate in the important optical long-wave 1.53- μm window have recently been available on the market. They are being offered by BT&D (a joint subsidiary of British Telecom and Dupont), Furukawa Electric, and AT&T, among others, and they cost about \$20,000.

They amplify at 20 to 20 dB and do so not only at a fixed optical wavelength, but also over a wavelength band of about 35 nm in width, which corresponds to barely 4,500 GHz. This makes this amplifier an obvious candidate for signal transmission with the conventional WDM [optical wavelength-division multiplexing] wave-multiplex method as well as for the future optical multiple-channel method (CMC [central memory circuit]), with which the individual channels are closely packed together at intervals of only 5 GHz.

Laser Costs Will Be Considerably Reduced

A single erbium-impregnated fiber amplifier with an attenuation of 21 dB already produces 126 times more transmission laser amplifier power so that 25,200 subscribers can now be connected instead of the 200 that are at present. Thus, a higher degree of cost sharing is produced for the lasers as well as for the fiber amplifier. A DM20,000 laser that serves 200 subscribers in a passive network costs DM100 for each connection; combining the same laser with a DM30,000 fiber amplifier will now serve 25,000 subscribers for only DM2 per connection.

Another feature of erbium-impregnated fiber amplifiers is that they can be cascaded, that is, they can be connected in succession with one another. In another experiment, Hill and Wyatt of the BTRL made a long-distance connection over a distance of 527 km between the main feed point and the local distribution station with a total of eight amplifiers. In this way fiber amplifiers are opening up entirely new degrees of freedom to design fiberglass BK networks for the distribution of television to the point of planning a national, complete coverage

cable network with only one BK distribution center. This would indeed be the "optical ether."

CMOS Process First Goal in Philips-SGS Thomson Chip Development

92WS0277B Duesseldorf VDI NACHRICHTEN
in German 29 Nov 91 p 24

[Article by JDB: "European Cooperation: Philips and SGS To Develop Chips Jointly"]

[Text] VDI-N, Duesseldorf, 29 Nov 91—Philips Semiconductors and SGS Thomson Microelectronics plan to collaborate closely in the development of a future semiconductor technology. A declaration of intent to that effect was signed by both firms last week. It covers close collaboration in the development of the CMOS [complementary metal oxide semiconductor] process for chip structures under 0.7 μm and also includes common design rules and connection libraries.

The activities are to be conducted in the joint SGS-Thomson Research and Development Center and the French Telecommunications Research Institute (CNET) in Crolles. The plan provides for calling on Philips specialists in the field of maximum integration at the center that is at present under construction and which should go into operation in mid-1992.

Philips Semiconductor Chairman Heinz Hagmeister considered the declaration of intent to be an important agreement in which both firms would contribute their know-how to submicron technology: "The position we attain through this will help the European electronics industry to successfully hold its own in competition on the world market and in addition strengthen the JESSI [Joint European Submicron Silicon Initiative (EUREKA project)] initiative."

Long an advocate of comprehensive European cooperation in the semiconductor sector, SGS President Pasquale Pistorio said with reference to the agreement: "We're very happy about this cooperation. It's an important step down the road to a strong European semiconductor industry."

The development of a 0.5- μm CMOS process on 8-inch wafers is planned as the first concrete project. This first plan should be completed by the end of 1993. Furthermore, both firms agree that Philips can also use the SGS pilot production program in Crolles for prototypes. Further details—especially the financial arrangements—were not known until now.

France: New Wind Tunnel for Automotive Testing

92WS0277C Duesseldorf VDI NACHRICHTEN
in German 13 Dec 91 p 27

[Article by Jeanne Collard: "Aerodynamic Optimization Under Extreme Weather Conditions: 'Jules Verne'—an All-Weather Wind Tunnel; France's Auto-Body Specialist, Heuliez, Tests Cars in New Plant"]

[Text] VDI-N, Nantes, 13 Dec 91—A gale is blowing in the Scientific and Technical Center for Construction's (CSTB) new wind tunnel. The CSTB Aerodynamics Center has recently been testing vehicles at 300 km/h. Rain showers or temperatures ranging up to 50°C are simultaneously cut in. Following a development phase, candidates [for production], such as automobiles, can go for a "thermal spin" in the "Jules Verne" wind tunnel.

The auto manufacturer is not striving for streamlined forms for esthetic reasons alone. The customer expects low fuel consumption and prevention of high air resistance. The French auto-body specialist, Heuliez, uses the "Jules Verne" wind tunnel at the Scientific Center for Construction Technology, CSTB, to optimize its products. To be able to aerodynamically measure objects on a scale as close to natural conditions as possible, the CSTB built "a superlative wind tunnel," as its engineers emphatically put it in Nantes on the French Atlantic coast.

According to them, wind speeds range from 70 km/h with a cross-section of 135 m² to 306 km/h with a cross-section of 26 m². Jet-shaped crossover points between cross-sections reduce losses due to turbulence in the peripheral areas. The blast comes from six blowers with a power output of 3,200 kW and adjustable blades.

"We can run all the blowers synchronously, but also introduce variations such that the objects being tested will be exposed not only to turbulence, but to real squalls," CSTB Technical Director Jacques Gandemer explained to VDI NACHRICHTEN. Furthermore, the oval building was constructed in such a way as to be able to function under realistic pressure conditions, Gandemer explained. Thus, part of the outer wall can be opened.

In this way the wind tunnel becomes U-shaped and may have a direct link with the air outside.

The goal of other efforts is to bring nature into the wind tunnel. "Jules Verne" is even now a premiere without any competition when it comes to simulating different weather conditions. Storm and wind are replaced by rain and high temperatures. The desert sandstorm still needs a few finishing touches and the icy wind from the North Sea with snow and hailstones is anticipated "in the wind tunnel" by the end of 1993.

CSTB President Pierre Chemillier is convinced that "effective cooperation with the industry at the European level will be produced on the basis of these diverse possibilities." Heuliez proudly alluded to their cooperation with the French aerospace company, Aerospatiale, and France's national space agency, the CNES (National Space Studies Center). Moreover, the fifth version of the European booster rocket, Ariane, will probably have to prove its stability on the ground—although on a scale of 1:100. But "Jules Verne" has already discovered the German MAN [Augsburg-Nuernberg Machinery Factory] for vibration-control tests.

It is only natural for the automobile industry, with its great need for testing, to display interest in the testing possibilities this offers. Since air resistance increases proportionately to the square of the speed of the vehicle, the figure for air resistance (c^w), which attests to the aerodynamic property of the vehicle, should be as low as possible. The French combine, Heuliez, a specialist in vehicle design anywhere from racing cars to ambulances to buses, actively "smuggled itself" into the wind tunnel along with its subsidiary, France Design. It is interested in being able to deliver fully tested, complete structural components to automobile firms that are their customers. "It's out of the question for us to test structures at the customer's [plant]," Heuliez manager Gerard Queveau summed it up. In cooperation with the CSTB, he sees a chance to win points in the race for extremely short production periods for new models—less than three years was mentioned. Queveau also sees opportunities "for finding original forms for *Nischenautos* through wind-tunnel tests."

While Heuliez is waiting for a second extension of the wind tunnel for extreme weather conditions, the company has already invested in ingenious testing devices that will be of particular use to the automobile sector. Thus, the company's engineers are using "water fountains" that make it possible for 30 cm of rain an hour to pour down on a 50 m² surface. The speed and direction of the raindrops, up to 4 mm in size, are simultaneously tracked with laser beams. "Despite the use of computers, the analysis is not so easy," Patrice Roulois, general manager of France Design, admitted.

While the French writer, Jules Verne, made literary history with his science-fiction novels in the last century, the wind tunnel in Nantes of the same name stands for realistic aerodynamic testing and research possibilities. These should guarantee optimal designing of future vehicles and conformity to effects produced by the environment.

European Aircraft Research Lab To Analyze Environmental Pollutants

92WS0277D Duesseldorf VDI NACHRICHTEN
in German 27 Dec 91 p 31

[Article by Christa Friedl: "Layer That Protects Against Ultra-Violet Getting Thinner in Northern Hemisphere Too; High Tech Expected To Solve Ozone Hole Problem; European Research Plane To Analyze Distribution of Pollutants"]

[Text] VDI-N, Duesseldorf, 27 Dec 91—The ozone layer is getting thinner. Although recognized for over 10 years now, the phenomenon of the hole in the ozone layer still poses a puzzle. For several years now, scientists have also been recording "miniholes" over the northern hemisphere. A flying atmospheric research laboratory that has just gone into operation is expected to help pinpoint the dangers threatening us due to the shrinkage of the ozone layer.

The reports do not create much of a stir any more since people now seem to be too familiar with the annually recurring hole in the ozone layer. The decrease in stratospheric ozone once again reached record heights this fall. According to the Ministry for Research (BMFT [Ministry for Research and Technology]), the latest measurements taken in October over Antarctica showed a drop in the amount of ozone of as much as 60 percent as compared with the ozone figures for the late 1970's.

The ozone layer filters out the harmful component of hard ultra-violet radiation at an altitude of 15 to 20 km (stratosphere). The chemistry of the stratosphere is altered by pollutants like chlorofluorocarbons (CFC) and fire-extinguishing compounds (halone) when chlorine and bromine atoms are separated from trace gases and, at especially low temperatures, processes are set in motion that break down the ozone. Reaction areas are the so-called polar stratospheric clouds in which the chain reactions start with the onset of the polar spring. In early December the BMFT, together with the Ministry of Defense, launched a "flying atmospheric research laboratory" in a Transall within the framework of the European ozone research campaign, "European Arctic Stratospheric Ozone Experiment (EASOE)".

During flights air samples will be taken at high altitudes, the analysis of which should provide important information on, for example, exchange processes between lower air layers and the stratosphere and also on the distribution and development of polar stratospheric clouds. Not least of all, these flights are expected to provide information about the distribution of harmful gases over the Arctic; namely, for several years now scientists have also been regularly recording drops in ozone volume of a few percent over the North Pole in the fall.

For these measurement tasks, remote detection devices and air-sample collectors were developed that can also take direct measurements in the stratosphere.

According to a BMFT communique, the object of the research campaign is to come up with a better understanding of the processes that are causing the ozone to break down. By means of this, predictions of future ozone losses should at long last become more certain. "Namely, we fear that the drop in ozone volume that has been measured over the southern hemisphere for years now is also taking place over the northern hemisphere," according to the BMFT communique. While conditions in the Antarctic have been in essence fairly well investigated, the state of our knowledge of the considerably closer "mini-ozone holes" is still very sketchy.

Desulphurization in Italy

92WS0277E Duesseldorf VDI NACHRICHTEN
in German, 27 Dec 91

[Text] The first plant that produces pure sulphuric acid directly by desulphurizing flue gases has gone into operation at EniChem's [National Hydrocarbons Agency Chemical Company] Gela (town in Sicily) plant. It

eliminates 95 percent of the SO_2 of a fourth of the flue gases from the state chemical company's 250-MW coal-burning power plant. EniChem uses a sulphur-rich coal to keep expenses down.

Combatting Phosphorus With Microorganisms

92WS0277F Duesseldorf VDI NACHRICHTEN
in German, 27 Dec 91

[Text] The Darmstadt Technical College Institute for Water Supply has started to operate a miniature purification plant with complete sludge treatment for research purposes. With it, research on the biological elimination of phosphorus will be possible. To this end, certain kinds of bacteria will be enriched through appropriate processes. Unlike the bacteria in conventional plants, these absorb considerably more phosphorus. When these bacteria are removed along with the accumulated sludge, a considerably higher percentage of phosphorus will be extracted than is in conventional plants.

Venture Capital Firm for Telecommunications Research

92WS0313A Stockholm NY TEKNIK in Swedish
19 Dec 91 p 4

[Article by Jan Melin: "New Money for Telecommunications"—first two paragraphs are NY TEKNIK introduction]

[Text] Thirty million kronor for innovations in telecommunications.

That is the core of a new venture capital company that will start operations at the beginning of the year. The money will go mainly to individual inventors and research workers.

The Teli concern fears there will be a dearth of new products within a few years.

"At the same time we know there are many inventors and researchers with good ideas in the telecommunications area," said Tote Cederlund, information director for Teli AB in Nynashamn.

To get hold of these ideas Teli will start up a new subsidiary at the beginning of next year, Teli Innovation AB. It will be a venture capital company with around 30-40 million kronor to hand out in the first couple of years.

The company will have a very limited staff, essentially just a managing director and someone in charge of finances.

"The managing director must have a very good general technical background and should preferably have a doctorate in engineering, for example" Cederlund said.

"But the director should not be an expert in telecommunications. This would lead to a risk that he or she will get bogged down in petty details."

In addition to its administrative staff the new company will have a research council of technical experts.

"We hope to be able to have very distinguished people on this council," said Cederlund.

When an idea or product is developed the intention is to have it commercialized by one of the Teli concern's companies. The purely practical aspects of how to arrange this will be determined by the inventor and Teli Innovation AB.

"There could be a royalty agreement or Teli might buy the product from those who developed it," said Cederlund.

"While the purpose is to enable Teli to bring out new products, it is also important to provide those who come up with the ideas with good opportunities to profit from them."

Today many inventors are afraid to breathe a word about a new idea to a large company. There are several examples of a company rejecting an inventor and then stealing his idea.

"We will maintain a very high ethical standard," said Cederlund. "If a single person is burned by us just once both the new company and the business side will be harmed. No thefts will ever be tolerated."

EC Abandons HDTV Rule on Satellite TV

*92WS0352N Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 13 Jan 92 p 3*

[Text] Meeting in Brussels, European Community telecommunications ministers abandoned efforts to impose an early and controversial new high-definition broadcasting standard for satellite television, agreeing instead on a much-reduced version of a directive proposed nine months ago by EC Technology Commissioner Filippo Maria Pandolfi.

The decision is seen as a defeat for France and the EC Commission, which wanted to conduct an active industrial policy to promote the development of HDTV in Europe enforced by mandatory EC standards.

Under the finally-accepted, but significantly altered, Pandolfi-directive, the controversial D2-MAC standard must be used for all new satellite-TV services in the extra-wide, 16/9 ratio format, as of 1995. However, as a result of eleventh-hour negotiations, existing TV channels will not be required to switch over to D2-MAC.

The new directive also offers opportunities for future broadcasts using all-digital technology of the type being developed by U.S. electronics companies.

To combat U.S. and Japanese competition in the sector, the agreement sets out compulsory transmission standards to be used for new satellite television services after 1 January 1995.

EC ministers will now try to promote the development of D2-MAC broadcasts in the 16/9 format. The Commission is also to make proposals to subsidise any broadcasters willing to use D2-MAC.

While it is still possible that the EC could subsidise D2-MAC adoption and development, it was made clear by ministers that direct references to EC financial support for D2-MAC transmissions are to be removed from the final directive.

It is believed that several broadcasters have expressed interest, including BSkyB in the UK; Canal-plus, TF-1 and A-2 in France; and the Filmnet unit of Switzerland's Cie. Financiere Richemont.

As much as ECU1 billion could be earmarked to subsidise D2-MAC broadcasts, according to Filippo Pandolfi. But this will now be dealt with in a separate directive as it would require the unanimous approval of all 12 EC governments.

Finally, EC ministers agreed that the D2-MAC directive would expire at the end of 1998, in view of the rapid pace of development of the technology. During this time, it agreed to track technological developments and propose new policies, including the development of digital HDTV technology, if necessary.

In order to finalise this latest agreement, all that remains is for a legally-binding strategy document to be signed by broadcasters and manufacturers.

Among those likely to be disappointed by this latest decision are Thomson SA of France and Phillips Electronics NV of the Netherlands—both have invested heavily in D2-MAC, and have recently launched expensive TV sets based on the technology. The two companies are, however, participating in the development in the U.S. of a purely-digital HDTV set which could form the basis for a U.S. standard. HD-MAC is an essentially analogue HDTV technology (see Americas section this issue).

Alcatel To Supply More Telecommunications Equipment to PRC

*92WS0352P Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 20 Jan 92 p 13*

[Text] The telecommunications administrations of the provinces of Xinjiang, Nei-Mongolia, Gansu and Quizhou have awarded Alcatel's Spanish subsidiary, Alcatel Standard Electrica, contracts worth more than ECU77.2 million to supply telecommunications equipment.

In total, the four contracts include the supply of more than 400,000 Alcatel 1000 S12 digital telephone lines, transmission systems and associated cables, as well as installation and training services.

Including these latest contracts, Alcatel Standard Electrica has signed a total of 15 contracts in 12 provinces to supply 1.2 million telephone lines, of which 400,000 have already been supplied.

The Alcatel group claims to hold 40 percent of China's digital switching market with about 5.7 million lines installed or on order. In the transmission sector—with

an installed base of 10,000 km of microwave and 1,500 km of fibre optic links—Alcatel has a 20 percent market share, it claims.

ENERGY, ENVIRONMENT

Hungary To Produce Bio-Diesel Fuel Under Austrian License

92WS0309C Budapest FIGYELO in Hungarian
19 Dec 91 p 5

[Unattributed article: "Bio-Diesel According to Austrian Licence"]

[Text] According to the plans, the use of environment friendly bio-diesel will become a reality in Hungary in the near future. At least Triplex, the Austrian subsidiary of the Nikex Foreign Trade Joint Stock Company, and the Austrian firm EVVA, owner of the license for the vegetation based fuel, are holding talks about this. An Austrian agricultural institute is also participating in the talks as an expert. Weak quality agricultural rape and sunflower surpluses are available in our country in large quantities and they might be used in this way, according to the experts. Diesel engine fuel is manufactured in Austria with a special technology on manufacturing lines with a capacity of 15,000-30,000 tons per year. It would be possible to build a plant with similar capacity in Hungary with an investment of 33-65 million schillings. The bio-diesel would not only save imports, it is also a desirable product because of its environment friendly nature.

FACTORY AUTOMATION, ROBOTICS

Czechoslovakia Contracts for Alcatel, Marconi Telecommunications Systems

92WS0345A Prague TELEKOMUNIKACE in Czech
Jan 92 [page inside front cover]

[Unattributed article: "Important Contracts Signed"]

[Text] On 28 November 1991 a contract was signed between the Prague Postal and Telecommunications Administration [SPT] and the German firm Alcatel SEL for delivery of a System 12 telephone exchange communications system, along with the corresponding transmission equipment for building a Czechoslovak comprehensive digital network. In 1992 more than 100,000 connections valued at approximately 45 million German marks [DM] (about 827 million Czechoslovak korunas [Kcs]) will be delivered, installed, and made operational. This capacity will be installed in Prague, Ostrava, and other areas of the North Moravian region.

Along with the delivery of an EWSD system from Siemens, this contract finishes the first phase of the modernization of the Czechoslovak telecommunications network. This was the fundamental objective of the competition opened by the Prague and Bratislava SPTs under the patronage of the federal Ministry of Communications in January 1991, and closed with discussions of the results of the competition by all three governments in

June 1991. An additional requirement of the competition which the firm Alcatel SEL met was the establishment of a joint venture for production of the selected system. In March 1991 the founding agreement was signed between Liptovsky Hradok Tesla and Alcatel SEL, creating the joint venture Alcatel SEL TLH, headquartered in Liptovsky Hradok. Production of the above-mentioned communications system will begin shortly and the joint venture is ready to deliver the system for future phases of the construction of the Czechoslovak telecommunications network and to participate in its further modernization.

On 12 December 1991 a contract was signed between the Prague SPT and the Italian firm Marconi. The purpose of the contract is the delivery of a digital transmission system designated for the construction of the comprehensive digital networks in Prague and Brno.

For this year the contract stipulates the delivery, installation, and startup of a total of 56 model ML33 systems designed to transmit up to 1,920 phone conversations on a single optical fiber. The equipment will operate with the digital exchanges imported from Germany and make it possible to improve the quality of phone service in Prague and Brno.

The contract is valued at \$3 million, which is about Kcs90 million. The Prague enterprise TESLA TELEKOMUNIKACE participated in drafting the contract. TESLA has formed a close cooperative arrangement with Marconi, aimed at future joint development and production, and capital participation by the Italian firm in its development.

Czech SITEL Automated Telecom Billing System Described

92WS0345B Prague TELEKOMUNIKACE in Czech
Jan 92 pp 14-15

[Article by Eng Emanuel Prager, candidate for doctor of science (CSc.): "Monitoring Subscriber Telephone Payments"]

[Text]

Current Status of Billing in the Czechoslovak Telecommunications Network

The most widely used telephone exchange systems, such as the P 51 or the PK, offer no means for checking the accuracy of the number of billing units recorded on subscriber meters. This is because the billing of telephone calls in these systems is based on the density of billing impulses, and the number of these impulses depends both on the distance between the conversing parties and on the duration of the conversation. During calls billing units are recorded on electromechanical meters, but the number of these units does not allow one to determine charges for either local or long distance calls.

This reality leads to frequent complaints, during the resolution of which the phone company cannot demonstrate that the telephone charges are accurate. It is only possible to connect to the subscriber's line (after the complaint) individual monitoring equipment that checks the activity of the subscriber for a period of time. Unfortunately, most of the time this is inadequate. Another possibility is to connect a control meter to the subscribers telephone on which the subscriber can calculate both overall calling charges and charges for individual calls. This however requires the transmission of the counting pulses from the exchange to the subscriber (for example using 16 kHz), which is expensive for a majority of subscribers. For older systems the entire process is difficult to execute, and in any event it does not guarantee full control.

One of the fundamental problems of existing systems is that they cannot identify an individual subscriber. The P 51 system does not have this capability at all, and can be retrofitted only with difficulty. It is, in principle, possible to do so with PK systems, but no existing exchange has as yet incorporated the capability.

The best solution would be to provide a subscriber with a bill that itemizes both the number of local calls and the charges for long distance calls, including all necessary time and location data. This is the standard technique used on all new systems, and will be used in all newly constructed digital exchanges. The problem remains, however, for the large number of subscribers connected to existing exchanges. These exchanges will continue in operation for another 15-20 years, despite the rapid rate of innovation (of the current 2.3 million or so exchange connections, more than half will still be in use in the year 2000).

Characteristics of SITEL Equipment

A number of firms have developed add-on equipment to provide the capability for billing individual calls even on existing systems. Because no similar equipment is yet in use in the CSFR, the TELINK company in Liptovsky Hradok developed a simple device which can be attached relatively easily to existing systems. The device allows full monitoring of subscriber charges, including data preparation for the printing of bills. This equipment, called SITEL, makes it possible to monitor the status of meters in the entire exchange, compile call data, and to process the data in a central computer for the issuing of bills. The equipment exists in two configurations, SITEL 1000 for larger exchanges, and SITEL 360/180 for smaller, PBX exchanges or for selected groups of subscriber lines. Both configurations operate the same way.

All SITEL systems consist of two basic units: a reading unit and an information center.

The reading unit is directly incorporated into the local or PBX exchange as an add-on. It provides the reading and short term writing of data about subscriber dialing and call units and passes this data to the information center. The reading unit is divided into modules for 960 extensions and is made up of individual boards for 60 connections. In larger

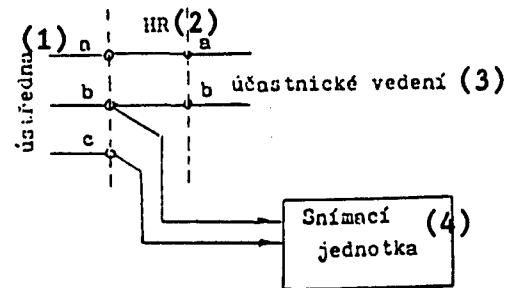


Figure 1. Attachment of SITEL Equipment to a Main Distribution Frame (for PK Systems)

Key: 1. Exchange 2. Main Distribution Frame 3. Subscriber lines 4. Reading unit

exchanges several modules are used, depending on the size of the exchange. The connection of the reading units to the information center is accomplished either over a bus (within a single exchange) or over a switched network (for long distance exchanges) using data transmission with modems.

The information center collects, processes, and archives information from the reading units and transmits to attached printers telephone bills with itemized phone calls. A single information center can serve a larger area, for example up to 100,000 connections. The information center is basically an AT type personal computer which is duplicated, along with all its peripheral equipment, to improve reliability.

The principle of the SITEL system is shown in the diagram in Figure 1, which also shows the possibility of attaching remote exchanges to a common information center.

The principle of attaching reading units to the actual subscriber inputs is shown in Figure 2, using a PK system as an example.

The reading unit is connected, in the simplest instance, through the main distribution frame to wires b and c of the subscriber line circuit. Wire b is used to read dialing impulses to determine the dialed participant number, and wire c is used to read the impulses that control the subscriber's meter. The other data necessary for fully specifying billing data are obtained internally from the equipment. The number of the caller is identified in the reading unit, from the physical connection of the input to the subscriber line circuit. Time data (date, duration of the call, etc.) is generated in the information center.

After processing this information it is possible to print for each subscriber a report containing:

- Caller number;
- Called number;
- Date and time of start of call;
- Duration of call;
- Number of billing impulses and resulting charge.

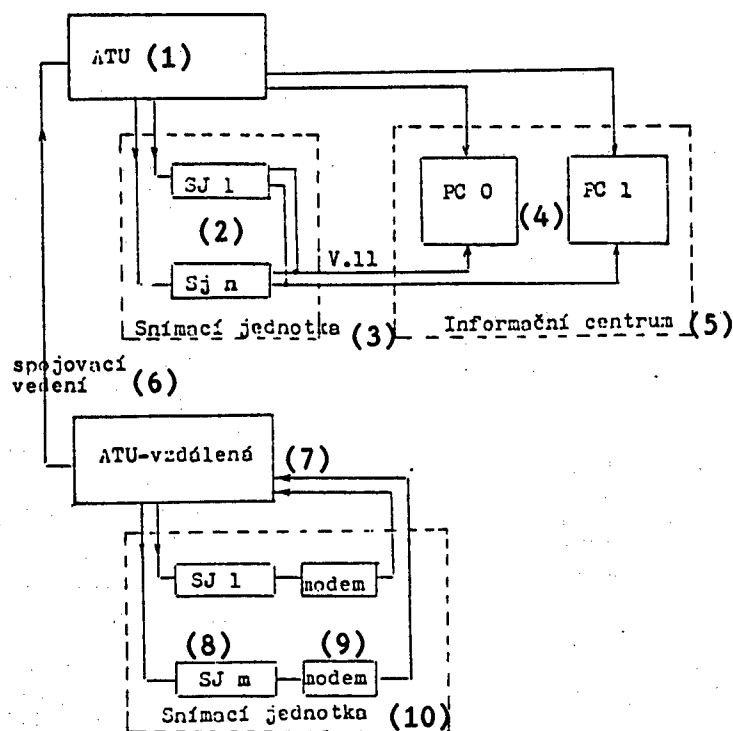


Figure 1. SITEL Equipment Diagram

Key: 1. Automatic telephone exchange [ATU] 2. Reading units 3. Reading unit 4. Personal computers 5. Information center 6. Connecting line 7. Remote ATU 8. Reading units 9. modem 10. Reading unit

In addition, software and hardware allow the generation of variations of the printout designed not only for telephone bills, but also for communications statistics, for example reports for groups of subscribers, statistical data on calls by billing zone, etc.

Monitoring subscriber calls also makes it possible to control the quality of the dials on subscriber phones.

In addition to the above-mentioned, simple (two wire) connection to a subscriber circuit, there are other variants. For example, for PK systems with push button, frequency dialling, a three wire connection is necessary (wires a, b, c). For a P 51 system a three wire connection will be necessary (wire b and two meter connectors) or only a two-wire connection for connecting simple converters to subscriber meters.

The equipment described above also makes it easy to upgrade a subscriber circuit with additional units for transmitting 16 kHz billing pulses to a meter at the subscriber (by looping wires a and b to the main distribution frame through the auxiliary equipment).

As this makes clear, the reading units are connected only to the main distribution frame, without involvement with the exchange equipment. Only in the last instance, that of the P 51 system with converters, which transform the electrical impulses of the meters to potential changes

on wire c, is it necessary to augment the rack 1 selectors with blocks of converters, one converter for each 50 subscriber connections.

For installation purposes the specifications of a reading unit are as follows: a reading unit for 1,000 connections fits in a subrack measuring 482 x 270 x 262 millimeters. The unit weighs 12 kilograms, and has a power requirement of about 60 watts.

The variant of the SITEL system described above is designed for large public or PBX exchanges. For smaller types of exchanges a SITEL 360/180 system is used. This system uses the same principles and is actually an installed variation of a SITEL 1000 system. In this variant, individual reading unit boards are located right in the personal computer (information center). The personal computer, which is not fully utilized in this variation, can be used for other purposes within the organization.

Advantages of SITEL Equipment

A SITEL system is relatively low cost on a per connection basis. However, significant investment expenditures are required when the system is considered as a whole. Once installed, the system will bring savings to the phone company by improving the quality of subscriber phone

bills. In the PBX variant, the capability of controlling long distance calls can result in savings on bills of 20-30 percent, meaning that the payback period for the system can be five to eight months.

When used in a PBX exchange it is possible, independent of payments and phone company bills, to establish for individual internal enterprise billing rates for specific types of communication. The main contribution in a PBX environment lies in the above-mentioned ability to monitor and bill what have to date been unidentifiable private phone calls, therefore radically reducing the costs for telephone usage. This is especially evident after making the transition to multiple rates for local calls, where the current, limited, simple equipment is ineffective.

We can expect this equipment to resolve one of the burning issues in communications and make it possible to issue phone bills at the level of today's modern communications systems. This will also make it possible to deal with refund requests for telephone payments. In addition, this equipment can fully replace equipment currently used to trace crank calls (the software allows the user to print a list of all calls directed at a given number). This equipment will also make it possible to offer what is a common and widespread service in the West today, namely reversing the charges to the called party (so-called free phone).

The SITEL system, offered by the TELINK company is being tested currently in the public system in Liptovsky Mikulas. It is anticipated that the system will also be tested in the Prague phone grid. Deliveries of systems capable of handling 100,000 connections should be possible in 1992, with production increasing gradually so that the equipment could be available for the entire system by 1995 at the latest.

S&T POLICY

Hungary: Effects of R&D Funding Cuts on Pharmaceuticals Industry

92WS0198A Budapest FIGYELO in Hungarian
7 Nov 91 p 15

[Article by Gabor Kovacs: "Development Doomed To Be Cut Back"]

[Text] According to the draft budget law for next year the Ministry of Finance wants to withdraw concessions from most research and development areas. The author of our article, director of the Pharmaceuticals Research Institute, shows by the example of the pharmaceuticals industry what serious dangers might accompany a drastic cut in R&D sources.

There is no need to prove again that the industry and agriculture of our country must carry out a market change of never before seen swiftness. Since a large part of the products sold heretofore in the East are not marketable in the West there are two roads before the

enterprises. They can give up manufacturing the "Eastern" products, which would be accompanied by a reduction in enterprise receipts and the dismissal of workers (in 1991 the receipts of Hungarian industry will probably fall by 15-16 percent and unemployment is increasing swiftly). The other possibility is to try to improve the quality of the products manufactured for the East or to develop new products which are marketable in the West as well. Both of these are technical development tasks.

Those who work in this area have known for a long time that success is a function of what is invested, especially as one goes up the ladder (enterprise-branch-industry). Before anyone mentions the developed technology coming in with foreign capital we must note that the technological transfer which has come in so far can hardly be noticed in Hungarian industry and agriculture as a whole, with the exception of a few specially situated large investments (Suzuki, General Electric).

The vital element of the ardently desired western market economy is technical development. If we really think about it, the advantage of the capitalist market economy over the socialist system was the result of the technological advantage acquired in the wake of succeeding scientific revolutions. Naturally R&D has a price. Using the pharmaceutical industry of the FRG as an example, the first figure here [figures not reproduced] shows that the rate of increase in R&D expenditures far exceeds that for production.

Falling Behind

Science and technical development is a very strongly affected area of the economic crisis of Hungary. According to data in the Statistical Yearbook, the entire national R&D expenditure—budgetary and enterprise—calculated at current prices has fallen by about 30 percent compared to 1986, corrected by the producers' price index (see figure). The decrease could become even more dramatic in 1991, when the expenditure, decreasing even at current prices, must be corrected by a producers' price index increase expected to be about 29 percent.

The national data are also reflected in the enterprise figures. The pharmaceuticals industry is the Hungarian branch which spends the most on innovation. According to the next figure the R&D expenditure of the six large enterprises has decreased in real value. Unfortunately, the government is showing the way by its "good" example in cutting back R&D expenditures.

The budget takes away a significant part, 2 billion forints last year and 1.8 billion forints this year, from the central technical development fund generated from payments from the managing organizations. About one fifth of the national expenditure is covered from budgetary sources, in contrast to, for example, the U.S. data which approach 50 percent.

We often hear that the financing of R&D is not a state task, that the enterprises should pay for it. We might

agree with this argument if the Hungarian budget were not, even today, much more centralized than that of market economies, as it is responsible for redistribution of more than 60 percent of the GDP.

First Victims

If we compare (see next figure) the cost structure of the Gedeon Richter Chemical Factory Company, the Hungarian enterprise which even today spends the most on R&D, with a few randomly chosen U.S. pharmaceutical enterprises there is a strikingly great difference in the ratio between the part of the profit withdrawn as tax and the part remaining at the enterprise. Richter attributes great importance to R&D, as proven by the fact that in 1988 it recorded among its undistributed costs a technical development cost of 902 million forints, despite the modest nature of the profit after taxes.

Unfortunately a contrary trend is being realized in our country in general. R&D is always the first victim of the strict budget management and the inflationary pressure directed at raising wages, since costs savings in R&D do not make their effect felt immediately. But in the middle term the competitiveness of the products deteriorates, direct cost factors grow in their costs structure, the unshared costs shrivel further, and so the cycle continues until the enterprise goes bankrupt.

The first victims of the shrinking of domestic R&D sources were the university departments and research sites, as a result of the lack of central and enterprise commissions. This process has no small role in the development of the present status of our higher education, which we want to improve today—out of absolute necessity.

In the past few years the Academy research institutes have also gotten into a difficult situation. Many regard these as some sort of remnant appurtenance of the socialist system, forgetting on the one hand that such things also exist in most capitalist countries and, on the other hand, that the fundamental justification for their existence is still timely today—they create unique places by branch of industry or professional culture where both an expert guard and establishments for innovation are available. Even among the large Hungarian enterprises there is hardly one which has a complete innovation infrastructure and expert guard, and hardly among the multiplicity of undertakings being formed!

Extra Income?

Beginning in 1992 the Ministry of Finance wants to eliminate the present 70 percent profit tax concession for enterprises performing R&D activity. This would mean, for example, cutting in half the after taxes profit of the past three years at the Pharmaceuticals Research Institute, withdrawing about 20-25 million forints. It is a national problem that amortization does not even cover the costs of maintaining the property. Thus far, well managed research institutes have been able to supplement their incredible investment needs, primarily for

machinery and instruments, from their after taxes profit. This possibility seems to be disappearing.

It is said that withdrawing the profit tax concession will mean only 200 million forints of extra income for the budget at the 1990 level. So the planned measure really has only political significance. Further tightening can be expected also in the amortization possibilities of R&D managing organizations.

It would be good to recognize that today the tasks of product structure change and catching up with Europe are much more technical development tasks than they are political in character. If we take this seriously we must make sacrifices for it. In the contrary case we must reckon with the colonization of the national economy.

TELECOMMUNICATIONS

Hungary: Three Firms To Set Up VSAT Data Transfer System

92WS0246C Budapest FIGYELO in Hungarian
5 Dec 91 p 5

[Unsigned article: "New Satellite Telecommunications System"]

[Text] A great improvement in the Hungarian telecommunications infrastructure can be expected from an undertaking which the Hungarian Broadcasting Enterprise, BCN Communications Network Planning and Service Ltd. and the Hungarian Telegraph Office have now declared their intention to create. The goal of the joint undertaking is to create and operate a VSAT artificial satellite data transmission system, which is suitable for satisfying a number of user needs.

The undertaking is intended not only to satisfy its own needs. It is expected that beginning from the first of next year it will be capable of creating a satellite telecommunications link—substantially more reliable than a cable link—between any two localities, for example for the computer systems of banks, insurance companies or government organs. BCN Ltd. has the expertise in packet switched data transmission technology to do this, the Broadcasting Enterprise is experienced in microwave techniques and the MTI ([Hungarian Telegraph Office] a news agency), as a firm with the largest private data network in Hungary, will make available its achievements in the area of data processing.

Alcatel Awarded First Czech Digital Exchange Contract

92WS0269M Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 9 Dec 91 p 1

[Article: "Czechoslovakia: Alcatel Receives First Digital Exchange Orders"]

[Text] Alcatel SEL, the German subsidiary of Alcatel NV, has been awarded a contract by the Post and

Telecommunications Administration of Prague (SPT-Praha) to supply and install its 1000 S 12 digital exchanges in Prague and Ostrava during 1992. The value of the contract is around DM45 million.

Alcatel SEL TLH a.s., the joint venture created by Alcatel SEL and the Czechoslovakian company Tesla Liptovsky Hradok earlier this year (*see ITI Issue 297*), will be involved in the project.

A DM70 million frame agreement has been signed for the Slovak region. It includes network groups serving Bratislava, Nitra, Banska Bystrica and Zilina and will be implemented in 1992-93.

Alcatel SEL has a 60 percent share in the Alcatel SEL TLH joint venture, with TESLA Liptovsky Hradok holding the remaining 40 percent. Production of Alcatel 1000 S 12 switching systems in the Slovak town of Liptovsky Hradok will begin shortly. The initial output will be 250,000 lines per year.

The contracts follow the Czechoslovakian PTT's decision in June to select Alcatel as one of the two suppliers for digital switching systems (*see ITI Issue 298*). Siemens was the other company selected which recently announced that it will be supplying 155,000 EWSD lines next year (*see ITI Issue 316*).

Report on Status of East European Telecommunications

92WS0274A Heidelberg NET—NACHRICHTEN
ELEKTRONIK + TELEMATIK in German
Dec 91 pp 563-566

[Article by Juergen Mueller under the rubric "Market and Competition": "Telecommunications in East Europe; Will Not Work Without Western Aid"; first paragraph is an introduction]

[Text] Government investment in infrastructure was substantially neglected in Eastern Europe in the past decades in the telecommunications sector. The countries hardly tried to bring their telecommunications systems up to the status of their western neighbors. The line density is very low in comparison with Western Europe. In the six Eastern European countries it comes to only a quarter of the density in the 12 EC countries. Poland, Hungary and Romania are at the end of the scale. Yugoslavia, Bulgaria and Czechoslovakia come close to the EC tail-enders Portugal and Ireland.

All the same, how great the capacity gap is can be estimated, but with difficulty. For instance, it is not clear how informative the present waiting list is, which suggests that in several countries the pent-up demand is almost as high as the present already available infrastructure. The waiting list in any case shows mostly the demand from the commercial sector, the government and the party apparatus, hence, of institutions that normally have easy access to the telephone.

Waiting Lists and Automatic Redialing

The Eastern European countries (Czechoslovakia, Hungary and the former GDR above all) before the war ranked with the highly developed economies with a first-rate telecommunications network and an efficient equipment industry. However, the ravages of war and the neglect of the infrastructure led to the capacity gap that exists today. The rates of growth for the telecommunications sector were low at 2-3 percent per year. As a result, not only did long waiting lists form, but the technology became obsolete and the quality of service dropped increasingly. The system's development concentrated mainly on the major cities. The undersupply in rural areas is appalling. In addition, the direct-dialing capability is still not available everywhere (especially in the country). Modern telecommunications services like data communication are almost totally lacking, so that the telex network alongside the telecommunications network is the most important means of communication for companies.

The quality of the telecommunications service is totally insufficient, first and foremost in long-distance service and international calls, because of overloading of the network. Automatic redialing is the norm for this reason. It disables the network and reduces call charge income. The remedying of malfunctions takes too long and line connections are often of poor quality because of bad insulation.

The technological gap between the Eastern European telecommunications networks and those of the West became larger in the 80s. While the western economies and even some developing countries modernized and digitalized their networks and today, as a rule, have at their disposal a thoroughly modern infrastructure, this is not the case in Eastern Europe.

Reasons for the Hold-Up

There is hardly any digital switching equipment, modern data communication facilities, efficient optical fiber networks or modern multifunctional terminals there. The reasons for the lag are:

- Telecommunications were developed mainly for the state machinery and trade and industry. Private households on the other hand were neglected.
- The telecommunications infrastructure never had high priority in the capital expenditure budget. Therefore, the telecommunications companies had hardly any funds for development of the system apart from capital spending on replacement.
- The equipment sector was relatively self-supporting and protected from competition. In addition there were technological restrictions in connection with Cocom [Coordinating Committee for Export Control]. For these reasons the capital outlay cost per line unit became substantially higher than in the West.
- The lag has become even greater with the fast technical development in this sector and the drop in equipment prices in the West.

Changed Priorities

The changed political situation has now also changed the priority for this sector. The number of companies is growing as a result of the restructuring and reorganization of the economy and with this also the demand for business lines. More and more private households want access to the telecommunications network. The importance of foreign trade is growing at the same time. Exports to the West must be increased, and direct investments from the West and the transfer of capital and technology are indispensable to that end. However, all this requires a telecommunications infrastructure that is capable of functioning.

Added to this are changed institutional structures. The new application possibilities for telecommunications are not only producing further demand, but are requiring a substantially more complex institutional imbedding of the telecommunications sector in the economy. This relates to the area of technical application just as much as to the regulating environment in which telecommunications has to be seen today.

Short-Term Solutions

However, the network capacity cannot be increased over the short term. The administrations are concentrating on keeping the network passably going and on replacing or restoring equipment written off long ago in component areas. Growth in capacity can be considered only over the medium term. However, over the short term there are two possibilities for improving management of the present shortage:

- A more realistic price policy that to some extent reduces access to the network (newcomer rationing).
- Clear-cut priority for the elimination of bottlenecks in the network.

The present telecommunications rates have hardly any relationship to costs or scarcity-induced prices. Telecommunications rates are still more of a political issue in the Eastern European countries than in the West. There was no charge at all for a telephone line in some countries in the first decade after the war. The current rates are for the most part too low, above all for local service. As a result, the revenues per line unit are small. Therefore a rate reform is essential in order to solve the financial problems at hand and at the same time to protect the network from collapse. Rates must be raised sharply in most of the countries. The harshness of the rate increase can be alleviated at the same time with rates outside peak periods that vary depending on the time.

Because of the financial problems associated with development of the network, the telecommunications administrations at the same time should raise line charges sharply. "Telecommunications bonds," which ultimately should ensure financing of the infrastructure, have been introduced for this purpose in Hungary. Then, in fact, these bonds, which can come to 2000 German marks [DM] per line, are paid interest on by the administration.

But this at the same time is resulting in a decrease in the demand for main lines. Then main lines are also to some extent increasingly being traded among subscribers, because that scarce good, a telecommunications line, has enormous priority above all in restructuring of the economy.

The first steps toward a short-term solution of the capacity problem under consideration must be aimed at improvement of the quality of service. It will also provide more returns for the existing infrastructure. Stronger investment in the examination of faults, traffic measuring and traffic optimization should bring relatively high returns through the additional management of long-distance telephone calls. In addition, an attempt must be made to rapidly raise the level of automation in long-distance and international service. Experts are proceeding on the assumption that a very high increase can already be obtained in this area with a relatively small investment.

Medium-Term Measures

The telecommunications administrations in Eastern Europe have not seen themselves as service businesses that provide an operable telecommunications infrastructure on favorable terms. However, in the course of reorganization of the economy the telecommunications administrations are now also being reorganized in cooperation with western consulting companies and are being separated from the government machinery as independent businesses. This is giving them stronger direct accountability and a distinct business mission. In addition to this, the possibility now arises for foreign equity participation through partial privatization and joint ventures. On the other hand, the post and telecommunications ministry's role is becoming that of a regulating and supervisory authority. Hungary and Poland are already relatively far along in this process, followed by Czechoslovakia.

Because the out-moded networks and the poor service quality do not suffice for modern big business, many administrations are changing over to the construction of overlay networks for the business sector. To some extent they are falling back on very short-term-effect measures here like the use of satellite links for important business communications to foreign countries (VSAT technology). All modern telecommunications services can be offered by means of these links to business centers on "telecommunications islands."

However, over the medium term every business center will have to be reached. This is simplest to achieve by means of a digital optical fiber overlay network, which is being installed already at this time in Poland and Hungary in order to improve the long-distance network level. This strategy is also being pursued at present by most other countries.

The third possibility is the increased use of mobile radio telephone, which till now has hardly been used there in the private sector.

Such a policy not only permits the short-term elimination of the worst bottlenecks, but in addition makes rate differentiation possible. The relatively price-inflexible customers could then give a higher amount for financing the infrastructure. On the other hand, the general rate reform mentioned above can turn out to be not quite so drastic. At the same time customers will maintain access to a qualitatively superior network and, in so doing, ease the load on the traditional network. The unequal treatment of customers brought about by rate differentiation, as well as the violation of uniform rates in the region, is a necessary price that the telecommunications administrations are apparently ready to pay.

Long-Term Goals

A solution designed for the long term is not possible without complete improvement of the network. However, enormous investment is necessary for this. For example, if an attempt is made just to reach by the year 2000 in the most important Eastern European countries the communications density of Spain in the year 1988 (which was at 27 main lines per 100 inhabitants), then the investment requirements associated with this are colossal. If one proceeds on the assumption that the costs per main line come to approximately \$2000, then a total of about \$3.5 billion per year in current prices is necessary in order to close this capacity gap in the six countries. Because of Poland's big lag and its relative size, the investment in this country weighs especially heavily, but in Romania and Yugoslavia as well.

This investment must be seen in relation to income and disposable savings, because the per capita gross national product comes to only about \$2000 to \$3000 in most Eastern European countries. Such a goal is no doubt unattainable without increased foreign financial aid.

In the absence of foreign currency the Eastern European countries are not in a position to go ahead with investment to the extent talked about here. Accordingly, the domestic telecommunications technology industry must make an important contribution in the endeavor to fill the capacity gap. However, this is a very difficult problem, with the simultaneously necessary restructuring of the Eastern European telecommunications industry. The equipment industries of the former GDR as well as of Bulgaria and Czechoslovakia were important exporters within the CEMA countries. The collapse of the traditional eastern markets and the attempt to switch equipment production to modern western technology is putting companies in a desperate situation that they cannot overcome without foreign aid. The switch to new technology and the technology transfer necessary for this cannot take place without western aid.

Accordingly, the medium-term goal must be to maintain the domestic equipment industry's market share in the individual countries. At present the import share in the telecommunications equipment sector in Hungary and Poland comes to 20 percent. It should rise to 40 percent over the short term with the start-up of the crash

program. However, after that, the domestic equipment industry will have to be increasingly busy in production, above all against the backdrop of strongly increasing market volume. In this connection, over the long term it can definitely come to a new organized interregional division of labor within the old CEMA economic region.

Estimates of western experts show how difficult the adjustment is from the technological viewpoint. According to them the industry there lags from five to 15 years behind in technological development, i.e., one to two equipment generations. The communication cable area is an exception. This lag should be reduced with the sharp lifting of Cocom restrictions, also under the use of joint ventures in production. All the same, however, the development of the telecommunications network in Eastern Europe in the final analysis should be linked with an industrial policy for the equipment sector in order to establish a branch that is able to survive over the long term.

Institutional Changes

The restructuring in Eastern Europe has brought the demand for deregulation in the telecommunications sector too. To some extent they are even prepared to go substantially further than in most countries of Western Europe and permit private carriers, above all in rural areas (in Poland and Hungary for example). Private suppliers are being permitted in mobile radio telephone, too, to some extent even in competition with the telecommunications administration. Such a policy of opening the market combined with joint ventures from the West is enabling rapid technology transfer and is shifting part of the enormous financing problem from the telecommunications administration to private carriers. The telecommunications administration can then concentrate on the long-distance network and lucrative international service.

This partial opening of the market, first of all, in the area of mobile radio telephone, but also with special long-distance networks in conjunction with the European railways, is presenting expanded institutional capabilities to the new telecommunications companies. They can accumulate experience in the area of joint ventures, test various sharing and loaning models and practice in competition with private suppliers. On this basis then they are also being armed for more radical steps, that are in store for them within the framework of partial privatization or increased international competition, for example.

This partial switch to private investment, however, is requiring of the responsible government administrative units a comprehensive regulating framework that is not easy to construct. Clear standards have to be set for private investors, and at the same time the impulse toward monopolistic behavior must be prevented. The networks have to be interlinked and be compatible. Participation has to be made possible for domestic industry. However, these questions have still not been decided in most of the countries, so that

only parts of the regulating framework exist thus far. Now the danger is that, in the attempt to entice foreign capital and know-how into the country, companies will be granted too much freedom. On the other hand, unclear standards

will lead to increased uncertainties for investors, so that the necessary private investment will fail to come and the closing of the capacity gap in the telecommunications field will be delayed for a long time yet.

Telecommunications Structure in Eastern and Western Europe (1988/89) (Sources: MDIS [expansion not provided], World Bank, private estimates)

Country	Inhabitants (Millions)	Main Lines (Millions)	Line Density per 100 Inhabitants	Waiting List (Thousands)	Waiting List per 100 Inhabitants	Direct Dialing Capability, %	Public Telephones (Thousands)	Telex Lines (Thousands)
Hungary	10.6	0.8	7.5	995 (85)	5.4	89	N/A	13
Poland	38.0	3.0	7.9	2000	5.2	91.5 (87)	25.6	33.5
Yugoslavia	23.4	3.2	13.6	142	0.6	99.7 (86)	7.9	13 (86)
Bulgaria	8.9	1.5	17.0	168	7.9	67.5	9.7	6.0 (83)
Czechoslovakia	15.6	2.1	13.6	372	2.4	N/A	N/A	N/A
Romania	23.0	2.6	10.4	800	3.5	N/A	N/A	N/A
Total	120.0	13.2	12.0					
EC(1987)	320.0	122.7	37.0					
EFTA (1987)	32.0	16.3	51.0					

Mobile Radio Telephone Projects in Eastern Europe (Sources: Pyramid Research, 1991; private estimates)

Country	System	Operating Company	Coverage	Startup
Hungary	NMT 450 MHz	MTV, 51% Hungarian, 49% US West	Budapest	October 1990
Hungary	890-898 MHz	HTC, 50% Hungarian, 50% Contel Cellular	Budapest	Postponed
Yugoslavia	NMT 410 MHz	Croatian PTT	Zagreb	August 1990
Yugoslavia	NMT 410 MHz	Slovenian PTT	Ljubljana	1991
Czechoslovakia	NMT 450 MHz	MPT, 51% Czech, 49% US West/Bell Atlantic	Prague, Brno, Bratislava	1991
Poland	NMT 450 MHz	Still open	Warsaw	1991-92

Investment Requirement in Order to Raise the Line Density From the Years 1989 to 2000 (to 27 Main Lines per 100 Inhabitants) (Sources: ITU, private estimates)

Country	Main Lines, Millions		Growth, % per Year	Total Cost (Billion US Dollars)	Cost per Year (Million US Dollars)
	(1988/89)	(2000)			
Bulgaria	1.5	2.4	4.5	1.8	169
Czechoslovakia	2.1	4.2	6.5	4.2	382
Hungary	0.8	2.9	12.3	4.1	375
Poland	3.0	10.2	11.8	14.4	1310
Romania	2.6	6.2	8.2	7.2	651
Yugoslavia	3.2	6.3	6.4	6.2	567
Total	13.2	32.2		38.0	3457

European Bank To Fund Telecommunications Upgrade in East Europe

92WS0352M Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 13 Jan 92 pp 1, 3

[Text] The European Bank for Reconstruction and Development (EBRD) has committed ECU263 million to five projects in Central and Eastern Europe. Of these five, two loans are in the telecommunications sector and another is in equity investment in an Hungarian computer company. The total investment in the projects from all sources will be ECU806 million.

In Romania, a loan equivalent to ECU142 million has been granted to Rom Telecom, the Romanian national telecommunications operator. The EBRD said the loan will help finance the connection of 600,000 new subscribers and the replacement of 400,000 aging subscriber lines. It will also be used to fund the construction of a long-distance overlay digital network together with the expansion of international capacity and local networks.

In addition, the Bank will provide technical assistance to improve the management and the efficiency of Rom Telecom, and to facilitate its transformation into a commercial organisation which could be readily privatised. Rom Telecom is the state-owned enterprise formed on 1 July 1991 to take charge of the telecommunications operations formerly under the Ministry of Communications.

The loan, guaranteed by the Romanian Government, will have a maturity of 15 years.

The EBRD first announced its strategy for Romania in November when it identified four priority areas for its operations within the country (see ITI issue 315).

The second loan in the telecommunications sector was granted to the Hungarian Telecommunications Company to help finance a modernisation and expansion programme for Budapest and rural areas.

The ECU90 million loan, guaranteed by the Republic of Hungary, will have a 12-year maturity.

Over a three-year period, the project will enable the connection of around 27,000 new subscribers, help to enhance the efficiency of the telecommunications system, reduce the congestion of the existing network and improve the call completion rate. Over a five-year period, the loan will help to finance the automation of exchanges and switchboards in the rural areas serving some 1,000 villages, the installation of approximately 1,200 public coin boxes, the installation of 20,000 new lines and the connection to the national and international network.

The EBRD also approved a ECU2.3 million equity investment in Microsystem Rt, a private Hungarian company which assembles, distributes and retails PCs, PC networks and develops and sells software for business applications.

The equity will be used to finance working capital, expand telecom activities, to increase manufacturing capacity and open additional retail outlets in Hungary. It will also be used to open the company's first two retail outlets in the CFSR.

Through the investment, the Bank aims to promote a Hungarian private company that provides essential and custom-designed business services to both the public and private sectors.

Most recently the EBRD announced support within the telecommunications sectors in Albania (see ITI issue 321 & 322), Bulgaria, Poland and the former Soviet Union (see ITI issue 318).